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Approche pragmatiste de l'accompagnement d'une transition agroécologique : une recherche action avec une association éleveurs et conseillers dans le rayon de Roquefort.

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Avant-propos

Ce travail de thèse part d'un questionnement personnel sur la nature du changement en agriculture. Comment est-il orienté, décidé, mis en œuvre ? Et par qui ? Plusieurs expériences ont participé à forger et nourrir ce questionnement: celle des rêves à propos d'un grand père arboriculteur et apiculteur biologique dans les années 70, avant tout expérimentateur du vivant et pionnier du développement de la bio en Lot-et-Garonne ; celle d'un stage auprès d'un éleveur laitier dans le Périgord noir, que la passion du métier fait tenir, alors qu'en fin de carrière, il ne trouve pas les moyens de s'adapter pour transmettre son exploitation ; celle enfin, de la force du collectif et de la coopération en agriculture, qui semble porter haut les agriculteurs qui y prennent part, lors de diverses expériences dans des lieux aussi différents que la porte du désert Marocain avec l'association Rosa, la porte de nos villes avec les AMAPs ou le cœur de nos cantons et de nos départements au sein des CUMAs. A l'heure où l'on entend partout que l'agriculture doit changer, qu'elle doit s'adapter pour répondre aux enjeux sanitaires, environnementaux et concurrentiels d'aujourd'hui, quels moyens, quels outils les agriculteurs ont-ils à leur disposition pour le faire ? Ne sont-ils pas les premiers artisans de ce changement qui prend source dans leur activité quotidienne sur leur ferme ? Et moi, agronome de formation, que puis-je faire pour aider, accompagner, me couler dans ce mouvement ? C'est imprégnée de cette histoire familiale, de ces rencontres et de ces expériences, questionnée par les transformations d'un monde agricole qui se cherche dans la redéfinition de son horizon et de ses pratiques, que je me suis lancée dans l'aventure collective de la thèse.

Je dédie ce travail à ma maman qui, sans doute un peu inconsciemment, a semé ces interrogations en moi, et qui j'en suis sûre, aurait aimé en suivre le développement.

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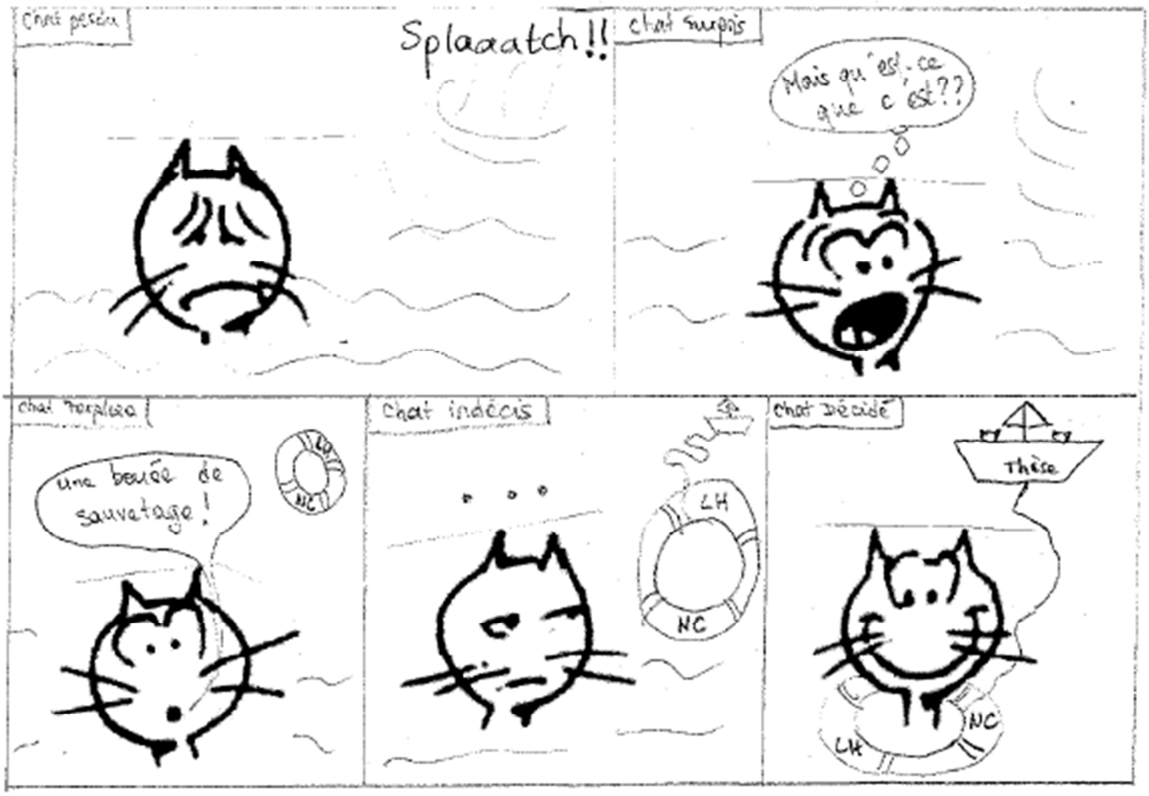

Trêve de plaisanterie, en pensant au démarrage de cette thèse c'est l'image qui m'est venue. La bouée de sauvetage ! Bon, je ne me noyais pas, hein ? Mais je ne savais pas trop où aller. Alors commençons par le début : Nathalie et Laurent, merci d'avoir lancé la bouée ! Vous avez été des accompagnants aussi complémentaires qu'indissociables pour moi, et ce travail aurait été complètement différent si l'un ou l'autre de vous deux n'avait pas signé ou suivi jusqu'au bout. Alors si parfois la mer a été agitée, ou si parfois le bateau a (un peu) pris l'eau, je suis très heureuse d'avoir été au bout de ce projet avec vous deux, et je vous remercie sincèrement pour votre confiance et votre investissement. A vos côté j'ai appris à construire un lien entre théorie et action, et votre accompagnement, jamais envahissant, y est pour beaucoup.

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Au cours de cette traversée, j'ai navigué entre plusieurs ports d'attache. Le premier, et sans doute le plus important à mes yeux, a été le Sud-Aveyron, dont j'ai sillonné les beaux paysages par toutes saisons en 2015, 2016 et 2017. Je remercie infiniment l'ensemble des partenaires et participants au projet SALSA pour leur motivation à trouver et construire des solutions aux problèmes rencontrés par les éleveurs du territoire. Merci à Patrice, Laurent R., Pierre, Nino, Alex, Laurent F., Jérôme, Tito, Olivier, Séverine, Alain, Laure et Estelle pour les échanges riches que nous avons eus lors des réunions du comité technique du projet. Ils ont nourri mes réflexions tout au long de mon travail. Merci également à Julie Sainte Livrade, qui a réalisé son stage de fin d'études en 2016 au sein du projet, et dont la ténacité et la curiosité ont été précieuses pour nous faire avancer et débloquer certaines situations problématiques, au-delà même de ce qui était prévu pour son stage.

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TABLE DES MATIERES

Introduction générale

Photo 1 : Paysage. Au pied du Causse du Larzac. Eté 2016. Source Camille Lacombe.

Problématique : accompagner localement la transition agroécologique nécessite d'articuler des transformations individuelles et collectives

L'agroécologie a été présentée en France comme un changement de paradigme et vulgarisée en tant que telle auprès du grand public dans les années 2000 par le philosophe Pierre Rabhi.

> *" Face à un système qui confisque le droit des peuples à se nourrir par eux-mêmes, l'agroécologie est une alternative éthique et réaliste, un acte de légitime résistance, qui permet l'autonomie des populations et la préservation de leurs patrimoines nourriciers. "*
> *Pierre Rabhi*

En France, l'emploi du terme agroécologie s'est d'abord fortement développé dans différents mouvements sociaux, comme le mouvement des Colibris dont Rabhi fut le fondateur. Son emploi et sa construction à l'international sont en revanche plus anciens et relèvent d'un mouvement reliant scientifiques et paysans d'Amérique du Nord et du Sud, en réaction aux impasses de la Révolution Verte (Goulet et al., 2012). A l'origine, on retrouve donc l'agroécologie comme un concept intermédiaire, rassemblant chercheurs, agriculteurs et acteurs de la société civile autour de la construction de systèmes agricoles et alimentaires (Francis et al., 2003; Gliessman, 2006), reposant sur un paradigme différent pour la production agricole du paradigme dit « productiviste » (Duru et al., 2014). Dans cette perspective, Wezel et al. (2009) proposent de dépasser les définitions strictement scientifiques et disciplinaires de l'agroécologie, qui la cantonnent à une application des principes de l'écologie à l'agronomie (Gliessman, 1998). Ils proposent que l'agroécologie ne soit définie ni exclusivement par des disciplines scientifiques, ni exclusivement par des mouvements sociaux, ni exclusivement par des pratiques, pour en faire un concept fédérateur d'actions intermédiaires entre ces trois dimensions. Le changement paradigmatique relèverait alors de l'application d'une série de principes pour agir ensemble et concevoir des systèmes agricoles plus durables et respectueux de l'environnement : des principes « historiques », liés à des pratiques et des techniques agricoles favorisant la protection et la valorisation des ressources et des processus écologiques, des principes méthodologiques pour la construction des systèmes agricoles, des principes socio-économiques visant à tenir compte des connaissances et des capacités des acteurs du monde agricole dans la construction de ces systèmes (Stassart et al., 2012). Sur le plan des principes historiques, (Martin et al., 2013)es auteurs mettent par exemple en avant l'idée de protection et d'amélioration des conditions de sol favorisant la croissance des plantes via la gestion de la matière organique et l'amélioration de la vie biologique des sols, la diversification et la valorisation de l'agro-biodiversité, ou encore l'intensification des interactions entre ses différentes composantes. Sur le plan des principes méthodologiques de l'agroécologie, ils insistent sur la nécessité de développer un

outillage multicritères de diagnostic, d'évaluation et de simulation des systèmes agricoles pour soutenir le pilotage des transformations. Ils insistent aussi sur la nécessité de favoriser la construction de dispositifs participatifs locaux de production de connaissances. Enfin, sur le plan des principes socio-économiques, il s'agit de favoriser la construction des capacités collectives de mise en débat et de dissémination des connaissances au niveau local, ainsi que de développer l'autonomie des producteurs vis-à-vis des marchés globaux.

Se plonger dans l'histoire de l'agroécologie revient à se plonger dans l'histoire de collectifs rassemblant différents acteurs, scientifiques, paysans et acteurs de la société civile autour de projets de réhabilitation ou de conception de systèmes de production agricoles mettant au cœur de leur fonctionnement l'autonomie des paysans, la souveraineté alimentaire des peuples et la préservation des ressources et des processus socio-écologiques garant de leur durabilité (Gliessman, 2009, 2012; Guzmán et al., 2013). Les dimensions collectives, co-construites et locales de la production des connaissances et des solutions aux problèmes rencontrés par les agriculteurs sont ainsi largement mises en avant. Duru et al. (2015) conceptualisent le changement de paradigme de l'agriculture vers l'agroécologie par la différenciation de deux voies d'écologisation de l'agriculture. « La voie faible de l'écologisation », ne relève pas d'un changement dans la manière de produire les connaissances et les innovations, et conserve la logique d'innovation-transfert du paradigme « productiviste ». Elle consiste soit en une amélioration de l'efficience des systèmes de production (par exemple les techniques développées pour l'agriculture de précision pour réduire, sans pour autant supprimer les doses de produits phytosanitaires utilisées à l'échelle d'une parcelle), soit en un remplacement de certaines pratiques conventionnelles par des pratiques plus raisonnées, mais calquées sur le modèle conventionnel d'agriculture (par exemple remplacer l'achat et l'utilisation d'engrais de synthèse par l'achat et l'utilisation d'engrais organiques). La mise en œuvre de « la voie forte de l'écologisation » relèverait pour sa part de l'agroécologie, car elle nécessiterait une re-conception des systèmes agricoles, c'est-à-dire une transformation en profondeur des pratiques, mais aussi des stratégies globales de gestion des fermes et des valeurs qui sous-tendent leur gestion (par exemple, une diversification importante des cultures, qui peut conduire à développer de nouvelles cultures sur la ferme à destination de l'alimentation humaine et à construire une filière locale de valorisation et de vente de cette récolte sur le modèle des circuits courts). La mise en place de « la voix forte » appelle à la construction de systèmes agricoles locaux d'innovation, rassemblant un réseau d'agriculteurs, d'institutions, d'entreprises du secteur agricole et de citoyens. Ils peuvent être soutenus par un collectif de chercheurs interdisciplinaire dans la gestion du processus d'innovation et de production de connaissances locales pour la transition (Duru, 2013; Duru et al., 2015). La nécessité d'un changement profond des modes de raisonnement et de l'organisation des processus d'innovation et

de développement agricole représente une difficulté au sein de ces collectifs (Moneyron et al., 2017), et appelle à un apprentissage de nouvelles façon de faire (Couix & Hazard, 2013; Hazard et al., 2017) et à la construction d'objectifs et d'horizons communs pour la transition (Duru et al., 2015).

Dans la perspective d'un développement de la « voie forte d'écologisation de l'agriculture », de plus en plus de chercheurs développent des projets de recherche participative pour soutenir la transition agroécologique, via la mise en œuvre de logiques et de méthodologies de co-conception (Lacombe et al., 2018; Meynard et al., 2012). Pourtant, peu d'articles scientifiques relatifs à ces dispositifs de co-conception relatent des transformations concrètes dans les modes de raisonnement, ou d'organisation de l'innovation chez les participants au processus. Très peu de ces projets sont portés au niveau local par les agriculteurs ou d'autres acteurs du monde agricole. De plus, ils ne visent pas forcément directement la transformation de leurs pratiques, ni l'apprentissage de nouvelles façons de faire (Lacombe et al., 2018). En effet, la majorité de ces projets de recherche participative envisage la conception comme un processus s'arrêtant à l'invention du concept ou du prototype, et ne vont pas jusqu'à l'implémentation et la mise en test des solutions dans la pratique des participants utilisateurs (Cerf et al. 2015; Prost et al. 2018; Lacombe et al. 2018).

De récents travaux interdisciplinaires mettent cependant en avant la dimension individuelle de la transformation des pratiques et des activités sous-jacentes aux processus de transition agroécologique (Coquil et al., 2016). Pour les agriculteurs, la transition agroécologique peut représenter une transformation de la façon dont ils conduisent leurs activités. La transition relève pour eux de processus d'apprentissages complexes et autonomes, sur leur ferme, et en interaction avec leurs pairs (Chantre, 2013; Cristofari et al., 2018), qui induit des changements dans les pratiques, les normes et les outils mobilisés quotidiennement pour agir, voire même dans les valeurs personnelles (Coquil et al., 2017). Pour les conseillers agricoles, différents travaux de recherche montrent une évolution des métiers selon des tendances qui peuvent paraître à la fois contradictoires et complémentaires. D'un côté, des travaux font état d'une spécialisation et d'une technicisation du conseil pour répondre à des besoins et questions de plus en plus pointues des agriculteurs en lien avec certaines techniques ou technologies (Di Bianco, 2018; Tchuisseu Tchepnkep & Labarthe, 2015). De l'autre, une série de projets s'intéressent à l'évolution des compétences et de la représentation du métier de conseiller vers des postures moins prescriptives, d'accompagnement individuel et collectif des agriculteurs, visant à les autonomiser et les appuyer dans la construction de leurs propres trajectoires de changement, en tenant compte d'enjeux diversifiés (Albaladejo et al., 2010; Cerf et al., 2011; Duhamel et al., 2017; Olry, 2013b). Dans ce dernier cas encore, l'importance de l'échange avec d'autres conseillers dans des situations similaires est une source d'apprentissage

et de construction de nouvelles représentations professionnelles (Auricoste et al., 2014; Guillot et al., 2013). Enfin, il semble que l'expérimentation de systèmes agricoles reposant sur les principes de l'agroécologie ou le développement de logiques de co-conception des innovations et des connaissances relèvent du développement de nouvelles logiques dans l'activité des chercheurs et techniciens des stations expérimentales (Coquil et al., 2016; Fiorelli et al., 2014).

Formulation de la question de recherche :

La prise en compte de cette transformation des activités individuelles et des métiers de la production et du développement agricole, à la fois comme finalité et comme moyen pour la transition agroécologique, est donc une perspective fertile pour appréhender la transition agroécologique. En effet, elle permet de questionner les modes d'accompagnement des changements en agriculture, en s'intéressant conjointement aux deux extrémités du problème : celui de la transformation des activités dans les fermes et celui de la transformation des activités de conseil-développement, dans une perspective de transformation des métiers des agriculteurs et des conseillers agricoles. De plus, elle met clairement en avant la question de la participation des agriculteurs à ces processus de transformation, en tant que pilote autonomes de leurs propres transformations.

Ainsi accompagner la transition agroécologique nécessite d'articuler deux types de transformation :

- la transformation de l'activité des individus, agriculteurs et conseillers agricoles via un processus de re-conception du sens qu'ils donnent à leurs actions et des outils, références et valeurs qu'ils mobilisent pour agir
- la transformation des modes de production de connaissances et des innovations via leur co-conception locale au sein de dispositifs locaux multi-acteurs, incluant les agriculteurs.

J'ai ainsi pu formuler le problème que mon travail de thèse vise à comprendre et éclairer (Figure 1):

Comment articuler re-conception des activités individuelles des agriculteurs et des conseillers et co-conception des connaissances et des innovations pour accompagner localement une transition agroécologique?

Avant de poursuivre, il me semble nécessaire de préciser que nous nous intéresserons dans ce travail aux transformations des activités qu'engendre la transition agroécologique à un niveau local. Par local, nous entendons l'échelle d'un petit territoire agricole, où les individus, agriculteurs et conseillers essentiellement, se rencontrent et partagent, en partie au moins, un contexte socio-

économique et pédoclimatique de travail. En effet, s'intéresser à la transformation des activités nécessite d'adopter une perspective « située », c'est-à-dire ancrée dans les situations de travail des individus dont les pratiques se transforment (Barbier & Durand, 2003). De plus, si les phénomènes de transition relèvent de changements à l'échelle d'une société entière (Magrini.et al., 2019), il nous semble que la compréhension de ces phénomènes et de la façon dont ils engendrent des transformations des pratiques des individus et des organisations de production et de conseil agricole nécessite de les observer à une échelle locale. Dans la suite du manuscrit, pour faciliter la lecture, nous ne préciserons pas systématiquement que nous parlons bien du niveau local de la transition agroécologique et des transformations qu'elle engendre. Cependant, c'est bien uniquement à cette échelle que se positionne ce travail.

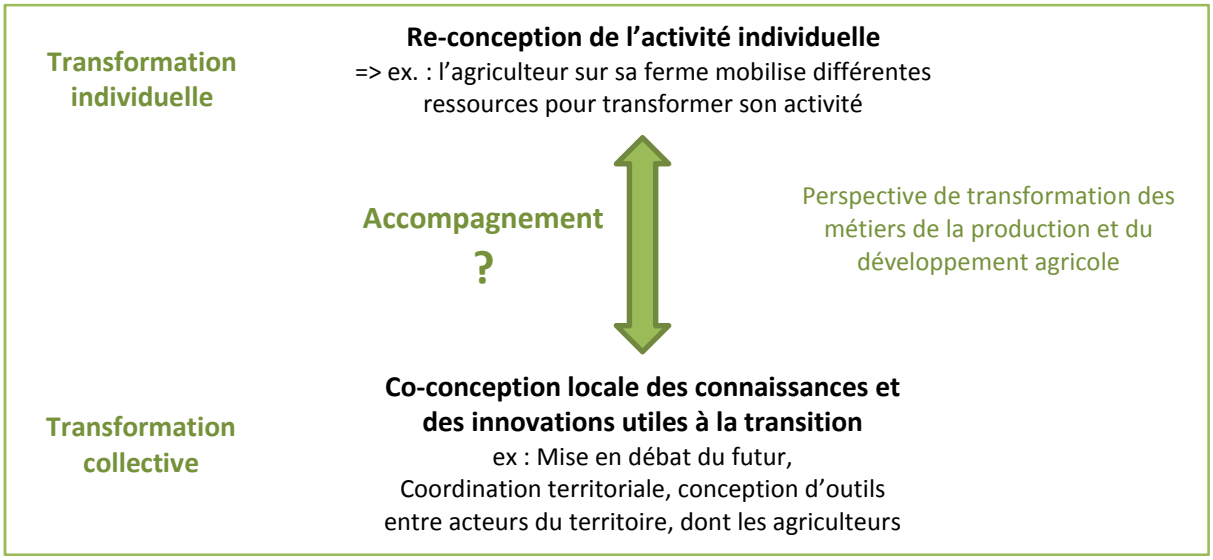


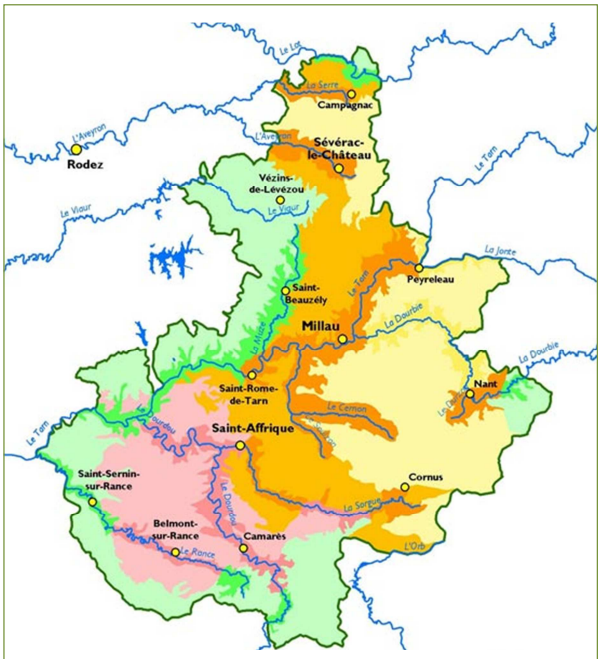
Figure 1: Schéma représentant le problème que mon travail de thèse vise à comprendre.

Stratégie de recherche: entre lectures théoriques et mise en pratique au sein du projet SALSA

Mon travail de thèse m'a amené à cheminer entre réflexions théoriques et mise en pratique et observations sur le terrain, au sein d'un projet de transition agroécologique local (Encadré 1). Ma contribution de recherche se construit ainsi entre une production de connaissances issue de la rencontre de ma question de recherche et d'une situation réelle de transition agroécologique, et la transformation de cette question au fil de mes observations et de mes lectures. Je reviendrai plus en détail sur le cheminement entre ces différentes activités un peu plus loin

<u>Encadré 1</u> : Le projet SALSA – Systèmes Agroécologiques Laitiers du Sud Aveyron

L'objectif principal du projet était d'engager une transition agroécologique dans les élevages ovin-lait sur le territoire du Parc Naturel Régional des Grands Causses. Il a été rédigé et sélectionné dans le cadre de l'Appel à projet CASDAR « Mobilisation Collective pour l'Agroécologie » (MCAE), lancé par le Ministère de l'Agriculture, de la Forêt et de l'Alimentation dans le cade de la loi d'Avenir Agricole pour le développement de l'Agroécologie (circulaire DGPAAT/SDDRC/C2013-3063, 06/2013).



Territoire du Parc Naturel Régional des Grands Causses : entités paysagères (Causses Avants-causses, Rougiers et Monts). Source PNRCG.

<u>Actions prévues</u> :

- Tâche 1 : Adapter et construire des outils de diagnostic agroécologique des fermes et les déployer dans les fermes de l'association
- Tâche 2 : Analyser les résultats des diagnostics pour faire ressortir des leviers d'actions à activer pour engager des changements de pratiques dans les fermes
- Tâche 3 : Concevoir et mettre en œuvre une méthodologie de suivi et d'accompagnement des changements dans les fermes

<u>Financement</u> : obtenu pour 3 ans (2014-2017) à hauteur de 150 000 euros.

<u>Public cible</u> : les éleveurs ovin-lait sur le territoire du Sud-Aveyron, en premier lieu les éleveurs adhérents à l'AVEM.

<u>Fonctionnement</u> : le projet est porté par l'AVEM et animé par une de ses salariées (agronome). Le comité technique du projet rassemble des représentants de tous les partenaires du projet, un vétérinaire et l'animatrice agronome de l'AVEM, ainsi que des représentants des éleveurs ovin-lait adhérents à l'association. Il se réunit régulièrement pour réaliser les différentes actions prévues dans le cadre du projet et décider de ses orientations.

<u>Les partenaires :</u>

Structures partenaires: - Implication dans le comité technique	*Compétences identifiées à l'origine du projet*
Association des Vétérinaires et Eleveurs du Millavois - 5 éleveurs - 1 animatrice-agronome - 2 vétérinaires impliqués partiellement	*- Expertise sanitaire et sur la durabilité des systèmes ovin-lait du territoire - 100 élevages ovin-lait potentiellement intéressés - Animation de formations collectives*
Centre d'Etude des Techniques Agricoles, CETA: - 1 ingénieur technico-économique - 2 éleveurs	*- Expertise technico-économique et sur la durabilité des systèmes ovin-lait du territoire - Animation de journées collectives pour les agriculteurs*
Parc Naturel Régional : - 3 chargés de mission du parc	*- Expertise environnementale et territoriale - Visibilité institutionnelle forte*
INRA de Toulouse : - 3 chercheurs	*- Aide au montage du projet - Expertise sur les méthodologies de conception participatives et d'accompagnement*
Lycée Agricole de la zone d'étude : - 1 enseignante - Chef de l'exploitation agricole du Lycée	*- Expertise sur les questions de formation initiale et professionnelle en agriculture - Exploitation du lycée = vitrine de la production ovin-lait sur le territoire*

L'intérêt d'une telle stratégie, de dialogue entre théorie et mise en pratique, que l'on retrouve assez fréquemment dans les démarches de recherche-action et plus particulièrement de recherche-intervention, est qu'elle permet de produire à la fois des connaissances sur le problème étudié, ainsi que de tester des méthodes qui permettent de le résoudre (Berg, 2004; David, 2000; Lewin, 1946). Schwartz (2009) parle de la nécessaire mise en place d'un va et vient entre « adhérence » et « désadhérence », pour produire des savoirs dans le cadre d'action concrètes de changement. Perez (2008) parle, quant à lui, de la nécessité d'un dialogue permanent entre les problèmes du terrain et les théories de sciences de gestion pour produire des théories intermédiaires « fondées », c'est-à-dire ancrées dans des problèmes concrets, mais pertinents pour les sciences (Perez, 2008).

Dans le cadre cette thèse, nous avons ainsi déployé un dispositif de recherche sur le terrain alternant des phases d'observation participante (Soulé, 2007) et de recherche-intervention (David, 2000; Perez, 2008) au sein du projet CASDAR SALSA (Encadré 1). Ce projet, porté par l'AVEM (Association des Vétérinaires et Eleveurs du Millavois, Encadré 2), avait pour objectif d'engager une transition agroécologique sur les fermes des éleveurs ovin-lait du Sud-Aveyron.

Les partenariats entre l'UMR AGIR, où j'ai réalisé ma thèse, et l'AVEM existaient depuis 2007. C'est suite à une succession de sécheresses dans le Sud-Aveyron, et face à un problème général d'autonomie alimentaire dans les élevages, que l'AVEM s'est rapprochée de Laurent Hazard pour travailler sur la gestion des ressources fourragères, et notamment sur la sélection participative de semences et de mélanges adaptés localement (Hazard et al., 2016, 2017; Ouvrage collectif, 2015).

Encadré 2 : L'AVEM – Objectifs, Activités, Fonctionnement

Origine et objectifs : L'AVEM est une association (loi 1901) créée en 1987 suite à une réflexion de plusieurs années menée au moment des luttes du Larzac. Elle regroupe 264 éleveurs sur 157 fermes, autour d'un suivi sanitaire préventif des troupeaux. Ce suivi est basé sur une relation de conseil forte entre le vétérinaire et l'éleveur autour de la santé du troupeau, permise par un passage régulier dans les fermes et une bonne connaissance par le vétérinaire des élevages et des éleveurs. L'association salarie aujourd'hui 4 vétérinaires (2 équivalents temps plein), une agronome, une secrétaire et un comptable en quart temps. Un bénévole assurant un appui administratif pour la gestion des projets.

Les adhérents éleveurs : les éleveurs adhérents sont majoritairement des ovin-lait (2/3). Le périmètre géographique de l'AVEM s'étend sur une centaine de kilomètres autour de Millau et n'est pas délimité par des frontières pédoclimatiques ou territoriales. L'association regroupe donc une grande diversité d'élevages. Les adhérents sont en effet dans des conditions pédoclimatiques variées : zones de causses (Larzac, Séverac, Méjean…), lacs et monts du Lévezou et de Villefranche de Panat, Rougiers de Camarès… Une bonne moitié des adhérents est aujourd'hui en agriculture biologique et l'autre moitié en agriculture conventionnelle, avec des niveaux d'intensification différents dans les deux types de systèmes. Enfin, la diversité se manifeste aujourd'hui également dans les stratégies de valorisation du lait de brebis, qui reste le produit majoritaire pour une grande partie des fermes. Historiquement tous les élevages livraient aux industriels de Roquefort, mais depuis une vingtaine d'années, certains se sont tournés vers de nouveaux industriels, notamment pour pouvoir valoriser leur lait en agriculture biologique. Certains producteurs ont choisi de monter des ateliers de transformation à la ferme, ou livrent une leur production à des laiteries locales.

Activités : Les activités de l'association se regroupent autour de trois types d'actions : le suivi vétérinaire individuel, les actions de formations collectives et la participation à des projets de développement. Le suivi vétérinaire est le dénominateur commun à tous les élevages adhérents. Chaque éleveur qui adhère choisit une formule de deux ou trois visites du vétérinaire chaque année, à des moments clés de la gestion du troupeau. Le suivi vise à améliorer les pratiques de gestion du troupeau ayant un impact sur sa santé, afin d'optimiser les performances de production des animaux à plus ou moins long terme. Les vétérinaires et l'agronome organisent une douzaine de journées de formation par an, à destination des éleveurs adhérents, tant sur des aspects sanitaires, qu'agronomiques. Enfin, l'AVEM participe à des projets de développement locaux ou à portée nationale. Les projets de développement à portée locale, impliquent fortement certains adhérents éleveurs avec, souvent, d'autres partenaires du territoire. Les projets de développement à portée plus générale, ont pour objet d'acquérir des références technico-économiques sur l'élevage ovin. Ils impliquent essentiellement les vétérinaires qui collectent et analysent les données des élevages suivis. Des événements festifs, des projets internes de partenariat avec des éleveurs sénégalais et des voyages d'études viennent compléter la vie associative de l'AVEM.

Fonctionnement : Le conseil d'administration est composé de 15 éleveurs issus des différents territoires sur lesquels l'AVEM est présente et des salariés de l'association. Il en définit les grandes orientations (émargement à un projet, planning des formations…) et représente l'ensemble des adhérents pour les choix et décisions de gestion quotidiens de l'association.

En 2013, faisant le constat d'un déséquilibre toujours plus important sur certaines fermes entre la taille des troupeaux et les potentialités de production fourragère, certains éleveurs du conseil d'administration ont proposé de travailler à la construction d'une méthode de suivi global des fermes pour appuyer les éleveurs lors de choix importants de changements. Ils faisaient en effet le constat que les interventions de conseil sont morcelées, chaque conseiller travaillant sur sa spécialité. Cela ne leur permet pas d'avoir une vision globale de leur ferme, intégrant à la fois les dimensions de l'autonomie vis-à-vis des intrants chimiques et alimentaires, de la viabilité économique des fermes et de l'impact environnemental des pratiques. Ce manque d'une vision globale leur rend alors la tâche difficile pour faire des choix raisonnés et cohérents sur le long terme. C'est dans cette optique qu'ils ont sollicité un financement CASDAR et ont monté le projet SALSA, avec leurs conseillers et Laurent Hazard (voir le projet tel que déposé pour l'Appel à Projet MCAE en 2013, Annexe 1).

Ce projet me donnait l'opportunité de construire une démarche de recherche-intervention, dans une posture d'accompagnement. En effet, n'étant ni porteurs du projet, ni animateurs de celui-ci, nous n'étions pas en position d'imposer nos façons de faire et nos idées au sein du comité technique. De plus, la commande qui était passée à l'INRA par l'AVEM était d'accompagner le processus de co-conception des outils de diagnostic des fermes, ainsi que de proposer des méthodologies d'animation pour engager la re-conception des systèmes, une fois le diagnostic posé dans les fermes. Cela me permettait donc d'adopter des postures plus observatrices à certains moments du projet, tout en assurant la possibilité d'une intervention de ma part lors de la dernière phase du projet, où nous devions être force de proposition pour animer des journées de travail au sein des fermes volontaires. Tout au long de ma participation sur le terrain, nous avons tenu des réunions régulières entre chercheurs participant au projet, Nathalie Couix, Laurent Hazard et moi-même, afin de construire, chemin-faisant, une activité réflexive et analytique sur ce qui s'y passait.

Chronique de mon activité au sein du projet SALSA

Mon activité de recherche m'a amenée à cheminer entre réflexions théoriques, et mise en pratique et observation au sein du projet SALSA et à l'AVEM. Les rebondissements du projet ont conduit à ouvrir et fermer des portes dans la compréhension des questions issues de la théorie. Inversement, les éclairages et les apports théoriques ont façonné petit à petit mon action sur le terrain et mes cadres d'interprétation de ce que j'y ai observé (Figure 2).

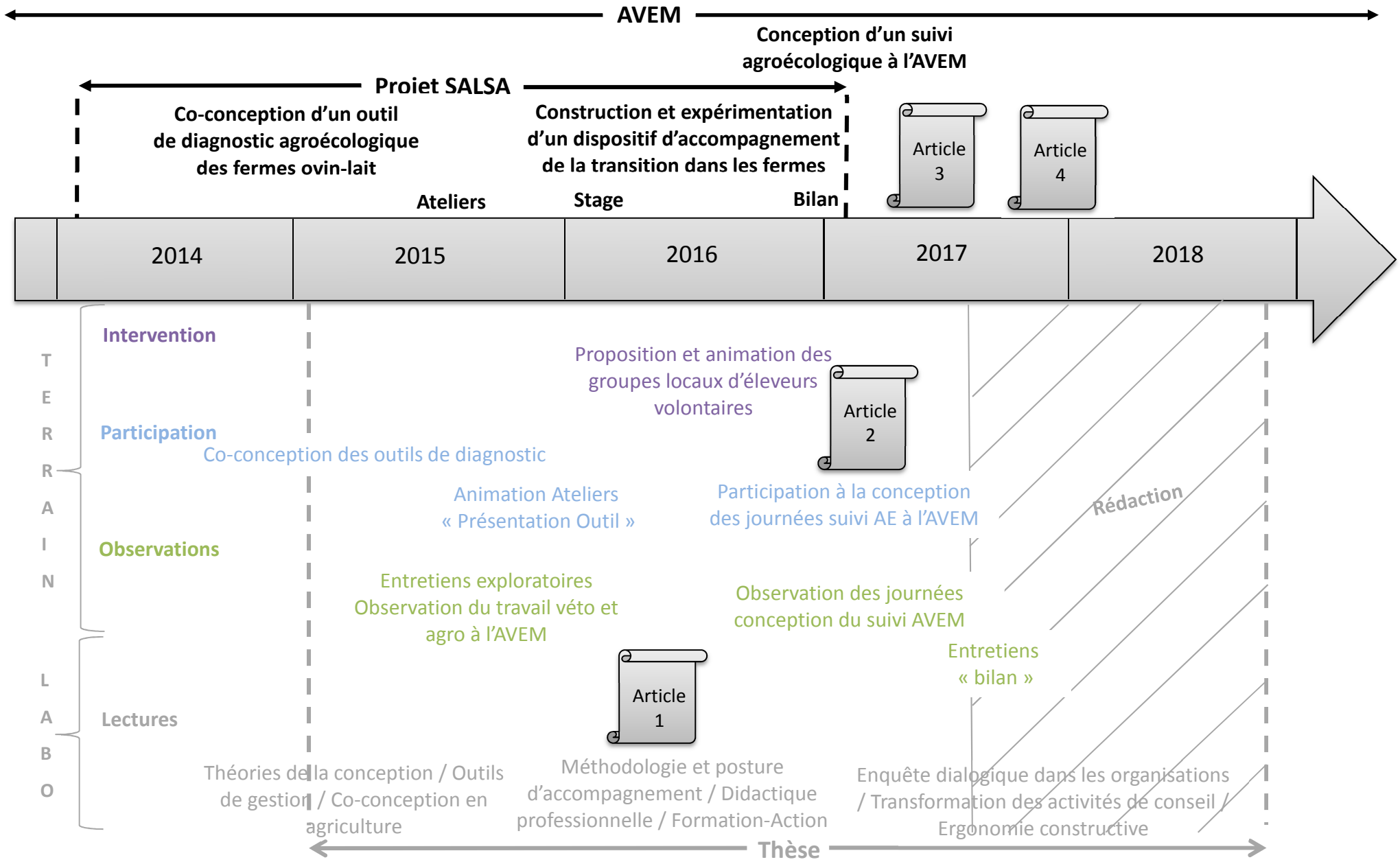


Figure 2: Frise représentant la démarche de travail mise en œuvre au cours de la thèse et l'insertion des différents articles dans cette dynamique.

Année 2014 :

Lorsque j'ai démarré ma thèse, le projet SALSA avait débuté depuis un an. Un précédent CDD au sein de l'UMR AGIR sur un autre projet CASDAR, auquel participait l'AVEM et mes deux futurs directeurs de thèse, m'avait permis de connaître « mon terrain ». J'ai notamment pu participer à l'ensemble des réunions du projet SALSA dès son lancement en février 2014, alors que ma thèse n'avait pas encore commencé. Au cours de cette première année, je suis plutôt restée dans une posture d'observation, même si il m'est arrivé d'apporter un soutien ponctuel aux personnes en charge de la conception des outils de diagnostic. Par exemple, j'ai réalisé un travail rapide de recherche bibliographique afin d'identifier des indicateurs génériques permettant d'évaluer le bon fonctionnement d'un sol sur une ferme. Ces indicateurs ont ensuite été discutés au sein du comité technique, pour décider de la façon de les adapter pour l'outil.

Le comité technique du projet a décidé de s'appuyer sur les compétences des partenaires et leur expérience concernant la durabilité des systèmes pour engager le travail de construction des outils de diagnostic en proposant deux modules: un module de calcul technico-économique de l'autonomie des fermes et un module d'évaluation de l'impact environnemental des pratiques agricoles à l'échelle de la ferme. Le choix de ces deux entrées a conduit à une distribution de la responsabilité des tâches entre les différents partenaires. Le CETA possédant déjà des compétences, une expertise et des outils pour évaluer la dimension de l'autonomie des fermes, l'ingénieur du CETA s'est chargé de la caractériser par un calcul, dans un aller-retour avec les éleveurs du comité technique et l'ensemble des partenaires. L'AVEM ayant déjà réalisé plusieurs travaux d'analyse des impacts environnementaux des pratiques dans les fermes de ses adhérents, l'agronome de l'AVEM a pris en charge la conception de ce volet, en s'appuyant sur l'expertise des différents partenaires et des éleveurs pour construire une grille d'évaluation multicritères de l'impact des pratiques agricoles sur l'environnement à l'échelle de la ferme. Une quarantaine d'enquêtes en fermes ont été réalisées pour tester la grille et recueillir l'avis d'autres éleveurs de l'association sur les critères déployés.

Plusieurs difficultés et controverses sont apparues au cours de cette première année. Le comité technique s'est heurté à des difficultés d'objectivation des pratiques agricoles et de leurs effets sur l'autonomie globale des fermes. Notamment, il a été difficile de quantifier l'impact des engrais chimiques sur la production laitière et donc sur l'autonomie des troupeaux. Cette notion paraissant indispensable aux éleveurs pour juger de l'efficacité et de l'autonomie globale des systèmes, il a été décidé d'évaluer uniquement l'autonomie alimentaire et d'approcher la notion d'efficacité via un calcul de l'efficacité énergétique, englobant à la fois le coût énergétique des engrais et des aliments, ainsi que toutes les consommations nécessaires à la production laitière. De plus, les premières enquêtes réalisées par l'animatrice agronome dans les fermes avec la première version de la grille environnementale, ont fait ressortir un débat entre les éleveurs adhérents à l'AVEM, qui s'est

cristallisé au sein du groupe d'éleveurs participant au projet : l'agriculture biologique est-elle un modèle idéal à atteindre pour les fermes ? En effet, le seul éleveur conventionnel du comité technique mettait en avant le fait que ses pratiques étaient assez proches du bio, mais qu'en contrepartie des quelques apports d'azote et des quelques traitements qu'il réalise, il était autonome en grossier et en céréales sur sa ferme et n'achetait pas de foin, ni de luzerne déshydratée venant d'Espagne ou d'ailleurs, contrairement à ce que font beaucoup d'agriculteurs bio du territoire. Le mécontentement des éleveurs conventionnels venait en réalité du fait que la grille d'évaluation environnementale des pratiques favorise par construction les éleveurs en agriculture biologique. Suite à ces débats, les pondérations entre les critères de la grille ont été revues pour accorder un peu moins de poids aux critères directement liés aux pratiques du cahier des charges bio, même si l'idée de viser des systèmes en agriculture biologique a été conservée. En revanche, il est apparu nécessaire pour les éleveurs de bien relier les résultats des deux outils pour chaque ferme et de mobiliser ces résultats ensemble. Le but était de contrebalancer la question des pratiques bio ou non bio avec celle de l'autonomie du troupeau et de l'efficacité technique et énergétique de la ferme, et de bien avoir une vision globale de la situation de chaque ferme. Cette dernière observation a conduit à une troisième difficulté qui est apparue en fin d'année : celle d'articuler le travail d'enquête en ferme de l'agronome de l'AVEM, en charge du déploiement de la grille d'évaluation environnementale et celui du technicien CETA, en charge du déploiement de l'outil d'analyse technico-économique de l'autonomie et de l'efficacité énergétique des fermes. En effet, il n'était pas simple pour eux d'articuler leurs activités pour enquêter les mêmes fermes. Au terme d'une année et demie de travail, la première version de l'outil de diagnostic agroécologique global SALSA, rassemblant l'ensemble des modules construits, n'avait été déployée dans sa totalité que sur une dizaine de fermes, la majorité étant les fermes des éleveurs du comité technique (pour plus de détail sur l'outil et son contenu, voir Annexe 2).

Année 2015 :

Mon implication sur le terrain a réellement débuté début 2015, avec le démarrage de ma thèse. L'objectif initial de mon travail étant très lié aux objectifs opérationnels de la tâche du projet - « concevoir et mettre en œuvre une méthodologie d'accompagnement de la transition basée sur la confrontation d'un suivi technico-économique et d'un diagnostic agroécologique des élevages » (source : projet déposé pour l'Appel à Projet MCAE en 2013, Annexe 1) – ma première année de thèse, en 2015, s'est organisée autour de deux objectifs :

- comprendre la situation de conception collective dans laquelle nous nous trouvions au sein du projet SALSA et mieux connaître la diversité des élevages et les attentes des éleveurs ovin-lait de l'AVEM, à qui le projet était destiné.

- analyser les différents courants théoriques de la conception et de la co-conception dans le domaine agricole et hors de ce dernier afin de cerner les plus à même d'être mobilisés au sein du projet SALSA.

Ainsi, durant l'année 2015, j'ai réalisé des entretiens exploratoires auprès d'une vingtaine d'éleveurs de l'AVEM. Suite à ces entretiens, j'ai pu faire un retour au sein du comité technique du projet pour présenter la diversité des visions et des projets des éleveurs concernant la transition agroécologique (Réunion du 06/10/2015). En effet cette diversité m'avait interpellée car elle questionnait le projet de transformation de l'agriculture porté au sein du projet SALSA, ainsi que la manière assez prescriptive et normative d'utiliser l'outil de diagnostic qui était prévue au démarrage du projet (voir ma présentation en Annexe 3). Suite à cette restitution, le comité technique a décidé d'organiser des ateliers dans les différentes petites régions où se situent les éleveurs de l'AVEM, afin de présenter le projet aux adhérents et de discuter de la pertinence et de l'utilisation de l'outil. Les éleveurs du comité technique ont proposé pour cette occasion de formaliser une représentation de leurs propres résultats de diagnostic sur un graphique à trois dimensions (Figure 3), afin de construire un représentation visuelle de la situation globale de chaque ferme, et de présenter eux-mêmes leurs propres résultats aux autre éleveurs de l'association lors des ateliers.

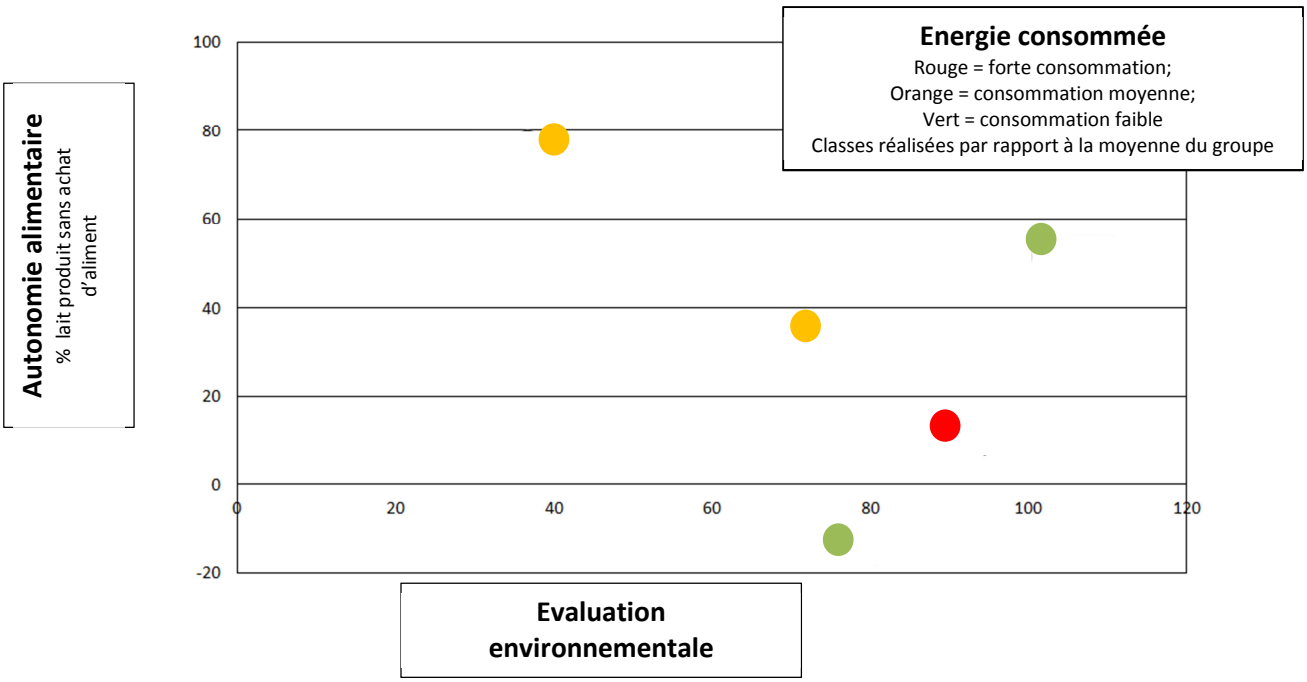


Figure 3: Représentation des résultats de diagnostic pour cinq fermes avec la première version des outils co-conçus au cours de la première année et demie du projet SALSA.

Le technicien CETA et l'animatrice agronome avaient la charge de présenter le projet et les outils de diagnostic aux participants. Je devais, pour ma part, animer un dernier temps de discussion sur la pertinence de l'outil et ses perspectives d'utilisation. Au cours des quatre ateliers organisés, la trentaine d'éleveurs qui y a pris part a reconnu l'intérêt de l'outil et de la représentation des résultats choisie pour avoir une vision globale des fermes et se comparer entre voisins. Ils ont en revanche lourdement insisté sur la nécessité d'ajouter au moins deux nouvelles dimensions d'évaluation au diagnostic : une dimension sociale et une dimension économique. L'analyse du déroulement de ces ateliers et de la façon dont l'outil a été mobilisé par les éleveurs à cette occasion nous a permis de mettre en avant son intérêt pour expliciter et débattre des stratégies globales et des projets individuels de changement au sein de petits groupes d'éleveurs (Lacombe et al., 2016, Annexe 4).

En parallèle de mon implication sur le terrain sur cette première année, j'ai réalisé une revue de la littérature des projets de co-conception entre chercheurs et agriculteurs dans une perspective de soutien à la transition agroécologique, en mobilisant un cadre conceptuel issue des théories de la conception (Chapitre 1). Au terme de cette première année, j'ai ainsi pu reformuler le problème de l'accompagnement de la transition agroécologique comme un problème d'articulation entre un projet collectivement conçu au niveau local pour la transformation des systèmes agricoles et les projets et situations individuelles de re-conception des activités des éleveurs sur leur ferme. J'ai d'ailleurs présenté et fait valider cette formulation du problème au sein d'un comité technique du projet le 26/01/2016 (voir ma présentation en Annexe 5).

Année 2016 :

Cette formulation du problème et les observations que j'avais pu faire lors des ateliers m'ont permis de construire une proposition d'animation pour la deuxième partie du projet, mobilisant l'outil de diagnostic comme support d'une animation collective dans les fermes pour comparer, expliciter et débattre des situations et des projets individuels des éleveurs a sein de petits groupes d'éleveurs volontaires. Pour construire cette proposition je me suis inspirée des pratiques de formation-action (Auricoste et al., 2014; Marc et al., 1998; Tallon, 2011), des pratiques d'accompagnement de la transformation des activités développées en didactique professionnelle (Bournel Bosson, 2006; Gorli et al., 2015; Saujat, 2005), ainsi que d'articles plus théoriques sur la notion d'accompagnement (Beauvais, 2004; Beauvais & Haudiquet, 2012; Paul, 2002). Cette animation était découpée sur trois jours par petits groupes de travail dans un premier temps. Les objectifs pour les éleveurs participants étaient les suivants (le détail de la proposition se trouve en Annexe 6):

- Expliciter leur stratégie individuelle sur leur ferme et leurs envies futures d'évolution
- Faire le point sur leurs pratiques et leur situation actuelle en mobilisant notamment les résultats du diagnostic agroécologique SALSA
- Confronter et comparer leurs pratiques et leurs stratégies à celles d'autres éleveurs sur le territoire pour s'en inspirer et/ou s'en démarquer
- Identifier des actions concrètes à mettre en œuvre pour progresser sur leur ferme dans le cadre de leurs envies futures et les discuter avec des collègues plus avancés ou différents conseillers/experts selon leurs besoins
- Identifier les ressources manquantes à l'échelle individuelle et collective pour mettre en place et accompagner les changements dans la durée à l'AVEM

Dans le même temps, nous avons co-encadré avec l'AVEM, le CETA et le Parc un stage de fin d'études de cycle ingénieur, dont les missions principales étaient d'améliorer l'outil de diagnostic global des fermes. Cela a notamment permis d'ajouter les dimensions sociales et économiques demandées par les éleveurs ayant participé aux ateliers, de formaliser les outils selon un format permettant leur utilisation par une seule personne (la stagiaire dans un premier temps, puis l'animatrice agronome de l'AVEM), et de réaliser une trentaine d'enquêtes globales auprès des éleveurs de l'AVEM ayant manifesté leur intérêt pour le projet et leur envie d'y prendre part. J'ai pour ma part mis en débat ma proposition d'animation avec le Conseil d'Administration de l'AVEM et lors de l'Assemblée Générale de l'association d'avril 2016, ce qui a permis d'identifier trois petits groupes d'éleveurs voisins volontaires pour l'expérimenter. J'ai par la suite animé ces trois groupes avec l'agronome de l'AVEM. Au cours de ces journées, l'outil a été utilisé successivement comme outil de diagnostic, support d'échanges entre pairs, support d'explicitation de choix et stratégies individuelles, outil de suivi des changements de pratiques mis en place, et support de simulation de changement de pratiques. L'animation de ces journées a été réalisée à deux voix par l'agronome de l'AVEM et moi-même (voir le Compte-rendu d'une journée de travail du groupe d'éleveurs du Larzac en Annexe 7). Ponctuellement, des vétérinaires ont été mobilisés sur des sujets spécifiques relevant de leurs compétences sanitaires et zootechniques. Pendant cette deuxième année de travail, j'ai resserré mon questionnement sur la façon dont les organisations de conseil peuvent accompagner la transition, alors qu'elles sont elles-mêmes dans une situation d'évolution de leurs propres activités. En effet, j'ai pris conscience du fait que ce que je proposais questionnait à la fois les façons de faire à l'AVEM et me permettait d'observer la façon dont l'AVEM se ressaisissait de ma proposition pour faire évoluer ses activités d'accompagnement dans la perspective d'une transition agroécologique des fermes adhérentes. En cours d'année, la vétérinaire historique de l'association, en charge de son animation, a proposé aux éleveurs du conseil d'administration un cycle de trois journées de travail

pour formaliser un service de suivi agroécologique des fermes à proposer par la suite aux adhérents. J'ai pris part à la construction de ces journées et j'ai observé leur déroulement. Le repositionnement de mon travail que j'ai opéré cette année-là est à l'origine de l'article proposé dans le Chapitre 2. Cet article analyse ma démarche d'intervention au sein du projet SALSA et ce qu'elle a produit à l'AVEM, tant en terme de transformation de l'activité des éleveurs, qu'en terme de transformation de l'activité des conseillers.

Année 2017 :

Le début de l'année 2017 a été consacré au bilan du projet SALSA qui s'est terminé au printemps. Au cours de ce bilan, j'ai organisé un retour des animations réalisées dans les fermes et de la façon dont l'outil de diagnostic global des fermes y avait été utilisé, à destination des partenaires du comité technique. En fin de projet, les partenaires ont fait le constat d'un apprentissage collectif d'une nouvelle façon de travailler ensemble et de conduire un projet à destination des éleveurs de manière différente de ce dont ils avaient l'habitude. Ils ont notamment exprimé le sentiment d'avoir travaillé différemment car les données produites via l'analyse des performances des fermes étaient directement mobilisées par les éleveurs eux-mêmes et réappropriées dans leurs propres réflexions et choix, plutôt que de servir à produire des références « *qui dorment dans des tiroirs* ». La démarche de co-conception locale et chemin-faisant de l'outil de diagnostic global des fermes a été retenue comme un résultat majeur du projet par les partenaires. Lors de l'Assemblée Générale de l'AVEM de mai 2017, il a été acté qu'une petite partie de la cotisation des adhérents serait dédiée à l'animation collective par l'agronome de groupe locaux travaillant sur la transition agroécologique, dont ceux initiés dans le projet SALSA. Le reste de cette animation est aujourd'hui encore financée via des journées de formation Vivéa ou la réponse à des appels à projet.

Six mois après la fin du projet et un an après la fin des journées d'animation dans les fermes, j'ai réalisé six entretiens auprès d'éleveurs ayant participé au dispositif de manière plus ou moins ponctuelle. L'objectif était à la fois de repérer si la participation aux journées s'inscrivait dans une démarche de réflexion globale sur leur activité et de changement de leurs pratiques sur leur ferme, et si c'était le cas, de repérer les ressources qu'ils avaient mobilisées pour cela, qu'elles soient directement issue de leur participation au projet SALSA ou non (Voir un exemple de guide d'entretien en Annexe 8). J'ai également continué à échanger ponctuellement avec l'agronome de l'AVEM, en charge de poursuivre l'animation des groupes et d'en développer de nouveaux. Cela m'a permis d'affiner mes observations et mon analyse de ce que mon intervention avait directement ou indirectement transformé, ou en tout cas questionné à l'AVEM (Chapitre 2).

L'année 2018 a été entièrement consacrée à l'analyse de mes résultats et à la rédaction des articles et du manuscrit de thèse. J'ai notamment réalisé une analyse rétrospective des différentes étapes du projet SALSA, qui a finalement été en partie orienté par la volonté que nous avions, avec mes deux co-directeurs, de mettre en test l'outil de diagnostic co-conçu à différentes reprises. Au cours du projet, le comité technique s'est réuni une quinzaine de fois, quatre ateliers ont été réalisés dans les différentes petites régions de l'AVEM pour présenter l'outil et le projet aux éleveurs de l'AVEM. Huit journées de travail collectifs entre éleveurs ont été animées dans les fermes (trois avec le groupe 1, trois avec le groupe 2 et deux avec le groupe 3). J'ai pris part à l'ensemble de ces journées, que j'ai enregistrées, voir filmées lorsque cela était possible. Cette analyse m'a permis de construire deux propositions d'ordre méthodologique pour l'accompagnement des processus de co-conception et de gestion de projet, au sein de dispositifs locaux multi-acteurs de production de connaissances et d'outils pour la transition agroécologique des fermes, tel que celui du projet SALSA (Chapitre 3 et Chapitre 4).

Organisation du manuscrit de thèse

Dans ce document, je reprends l'ensemble du cheminement que j'ai suivi tout au long de ma thèse pour traiter la question de l'articulation entre re-conception des activités individuelles des agriculteurs et conseillers et la co-conception des connaissances et des innovations dans la perspective d'accompagner localement la transition agroécologique. Pour donner à voir la façon dont j'ai opéré les différentes reformulations du problème au contact de ma situation de travail et dont nous avons façonné cette situation par nos propositions et notre compréhension, j'ai décomposé ce document en quatre chapitres. Au fil des chapitres, j'analyse la façon dont la transition agroécologique conduit à revisiter l'accompagnement des changements en agriculture. J'identifie également des façons de construire et mettre en œuvre l'accompagnement local de cette transition. Le premier chapitre repose sur un article de review, publié dans le journal Agricultural Systems. Cet article analyse la manière dont les différents courants existants de co-conception des innovations en agriculture contribuent plus ou moins à soutenir la transformation des pratiques et des activités des individus qui y prennent part, dans une perspective de transition agroécologique. Le deuxième chapitre est constitué d'un article à soumettre dans le journal Human Relations. Il propose un cadre de lecture et une analyse de la façon dont la transition agroécologique requestionne les activités et la relation de conseil en agriculture. Le troisième chapitre se compose d'un article à soumettre dans le Journal Co-design et constitue une proposition méthodologique pour l'accompagnement des processus de co-conception en agriculture visant à soutenir les processus locaux de transition à l'échelle individuelle et collective. Enfin, le dernier chapitre repose sur un article à soumettre au

journal Agriculture and Human Values. Il constitue une analyse de la façon dont la transition agroécologique locale questionne les modes de raisonnement et de gestion des processus de production de connaissances pour les individus qui y prennent part. Il propose une perspective pragmatiste pour gérer les projets collectifs de transition agroécologique à l'échelle locale. Dans une dernière partie, j'expose et je discute les propositions théoriques et méthodologiques que ce travail de thèse m'amène à faire pour revisiter l'accompagnement des changements en agriculture, en proposant notamment le cadre de l'enquête pragmatique comme heuristique pour penser l'activité d'accompagnement local de la transition agroécologique.

Chapitre 1

Co-concevoir des systèmes agricoles avec les agriculteurs : revue de la littérature

Photo 2 : Débat. Deux éleveurs discutent des mélanges prairiaux qu'ils testent chez eux devant la collection de sainfoin mise en place par l'AVEM et l'INRA chez un éleveur du Larzac. Mai 2010. Source Laurent Hazard.

Contexte et insertion dans la thèse

Lorsque j'ai démarré ma thèse, le comité technique du projet SALSA, auquel nous prenions part, travaillait depuis près d'un an à la co-conception d'un outil de diagnostic agroécologique des fermes ovin-lait du Sud-Aveyron. Une des hypothèses fortes posée par nos partenaires, était qu'il est nécessaire de construire ces outils au sein d'un groupe local d'experts multi-compétent sur les systèmes et les problématiques agricoles sur le territoire, incluant des éleveurs eux-mêmes afin que ces outils soient utiles à la transition agroécologique des agriculteurs du territoire. De leur point de vue, cela devait permettre de construire un outil localement adapté et pertinent pour les soutenir dans leurs propres questionnements sur leur ferme.

Si moi et mes co-directeurs de thèse partagions pour partie ce point de vue, le fait que l'outil soit co-conçu localement ne nous semblait pas forcément une condition suffisante pour qu'il soit utile pour et utilisé par les éleveurs ovin-lait du territoire. Notre rôle au sein du projet étant d'accompagner le processus de conception, et une fois l'outil déployé dans les fermes, de proposer une méthodologie pour accompagner la transformation dans ces fermes mobilisant les résultats produits par l'outil, la question de son utilisation et de sa pertinence pour les éleveurs était donc centrale pour nous.

Dans cette perspective, j'ai réalisé un état des lieux des démarches existantes de co-conception dans le domaine agricole, afin d'identifier la manière dont chacune d'elle traite du problème de l'appropriation par les utilisateurs eux-mêmes des outils et des artefacts co-conçus, ainsi que de la façon dont elles permettent ou non aux agriculteurs eux-mêmes de s'en saisir pour instrumenter leur propre transition agroécologique. En effet, de nombreux chercheurs aujourd'hui s'engagent dans des processus de co-conception de systèmes agricoles innovants avec l'objectif plus ou moins loin lointain de soutenir la transition agroécologique des fermes (Meynard et al., 2012). Pourtant, la façon dont ces processus participent réellement à la transition agroécologique dans les fermes et dont ils tiennent compte des situations et problématiques singulières des agriculteurs avec lesquels ils travaillent n'a pas été explorée.

Afin d'instruire cette question et d'identifier des courants et des démarches de co-conception susceptibles de nous être utiles dans notre situation de travail collective sur le terrain, j'ai donc réalisé une analyse bibliographique de type qualitative des différents courants de la co-conception dans le domaine agricole, en portant une attention particulière à la manière dont chacun prenait en compte, voir organisait le processus, de manière à viser la transformation des pratiques dans les fermes. Pour cela, j'ai mobilisé un cadre analytique issu des sciences de la conception pour

appréhender les différentes dimensions à observer au sein d'un processus de conception pour qualifier le lien entre les objectifs de transformation donnés au processus de co-conception et ses effets réels dans les situations de travail des co-concepteurs.

Cette analyse m'a permis d'identifier cinq courants différents de co-conception dans le champ agricole et de mettre en avant le fait que la majorité des projets ne visent pas à outiller directement la transformation dans les fermes. Ils visent plutôt à produire des connaissances et des prototypes innovants, dans des logiques finalement assez classiques d'innovation transfert. Certains projets, conduits dans des logiques de recherche-action tendent à accompagner pas à pas le processus de transformation dans les fermes via la co-conception de plateformes d'expérimentation et de formation. Cependant la conception reste, dans beaucoup de cas, dirigée et orientée par les objets de recherche et les questionnements des chercheurs. J'ai ainsi pu montrer qu'il est nécessaire d'articuler les approches visant la production de connaissances et celles visant l'accompagnement des changements pas à pas. Pour cela, il serait souhaitable de mieux partager le leadership des projets entre chercheurs et agriculteurs et d'organiser les processus de co-conception localement. Il est serait également important de développer des démarches de co-conception qui s'inscrivent directement dans les situations d'usage des artéfacts et des prototypes de systèmes, via la conduite de démarches de conception « pas à pas », tenant compte des systèmes locaux d'activité à transformer et des situations singulières des agriculteurs sur leurs fermes.

Résumé de l'article 1

Agroecology is a new paradigm whose aim is to redesign farming systems. The implementation of its principles engages farmers in a radical transformation of their practices, their way of reasoning and their participation in local knowledge production and innovation processes. Acknowledgement of this transformation now frequently leads researchers to invite farmers and other stakeholders to participate in research projects on the design of innovative farming systems. However, the objective of their involvement and the role farmers play in such projects is rarely made explicit and can range from simple knowledge providers to co-designers. Here we review the role of farmers and other stakeholders in such participatory research projects, and its impact on their learning and engagement in the local transformation of farming systems. Using a framework based on design theories, we analyzed thirty-nine papers on the design of innovative farming systems in which farmers and other stakeholders were involved. We identified five main co-design approaches to the design of agroecological farming systems: "De-novo design", "Case-study design", "Niche innovation design", "Co-innovation", and "Activity centered design". Despite this diversity, if researchers aim to promote the development of agroecology, there a still need to better link researcher-oriented approaches and support-oriented approaches, to design local set-ups that will help farmers and other stakeholders in the long term process of redesigning farming systems. In terms of design methodologies, this means sharing project leadership with farmers and organizing co-design locally to better bridge the gap between thinking and doing. This means better accounting for the singularities of farmers' situations and of the local activity system to be transformed. This paper should help researchers choose their participatory methodologies better with respect to both to their transformational and scientific goals, when organizing participatory projects to support the development of agroecological farming systems.

Article 1

Designing agroecological farming systems with farmers: a review

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Introduction

Developing sustainable agriculture requires reducing chemical inputs that are still widely used to reduce climatic and environmental uncertainty and improve production yield. Agroecology tackles this problem by restoring and managing the natural regulation of the agroecosystem that is expected to limit the use of chemicals to support agricultural production (Francis et al., 2003). In the "Efficiency / Substitution / Re-design" framework developed by (Hill & MacRae, 1996), agroecology falls into the category 'Re-design' since it implies the transformation of farming systems to (i) better match farm scale production methods and local ecological, economic and social potentialities and (ii) to restore and maintain a functional agroecosystem (Darnhofer et al., 2012). Supporting farmers in the development of agroecology requires supporting the transformation of their farming practices to maximize local potentialities (Francis et al., 2003). This can be achieved by a change in the mode of reasoning about farming systems from an artificialized system in which production is supported by adequate inputs, to a logic of steering the socio-ecological processes of the local agroecosystem to support production (Hazard et al., 2017). It also implies a transformation in the way farmers are involved in innovation and knowledge production processes, to co-produce and locally experiment appropriate techniques, practices and types of organization that suit their specific situation (Gliessman, 2009; Guzmán et al., 2013; Stassart et al., 2012). To move toward agroecological farming systems, farmers observe and exchange practices with their peers, conduct experiments in their own situation (Cristofari et al., 2018) and exploit diverse sources of knowledge to enable them to act in their own situation (Toffolini et al., 2017). While agricultural modernization has attempted to reduce farmers to simply implementing "recipes", the transition to more agroecological farming systems means restoring their roles as pilots of farming systems that innovate and co-produce relevant knowledge to enable them to change in their own situation directly (Prost et al., 2018).

Researchers who work on designing more agroecological farming systems are aware of this change and are developing participatory approaches to include farmers and other stakeholders in their work. If they aim to support the development of agroecology, they need to know whether these participatory approaches enable a real change in farmers' role in the innovation process and if their intervention helps farmers test and implement new ways of reasoning and new practices. This in turn, requires characterizing the expected role of participants as providers of knowledge, targets for learning or co-innovators.

To characterize the role of farmers in participatory research, Pretty (1995) produced a typology that ranged from manipulation by the researchers, consultation, interaction, up to self-mobilization

by the farmers. The challenge of participatory research is the co-production of knowledge to inform a farmer's problematic situation. Taking a design perspective makes the relationship between knowledge production and action to transform that situation more explicit. In fact, Hatchuel defined "Design" as the "simultaneous generation of knowledge and objects" with the aim of achieving "an unknown desire" (Hatchuel et al., 2013). This process can be organized according to different ways of articulating knowledge production and transformational goals, for example: the extraction of knowledge objectified in a model that will serve to define public policies, design driven by researchers that invites farmers to engage in a learning process, or co-design in which farmers and researchers work together to find solutions to a specific problematic situation (Asaro, 1999).

These different strategies do not imply the same level of learning for the participants and transformation of their practices part way through the process. This paper aims at making these aspects more explicit to allow researchers to choose their own strategy to enable farmers to participate in the design of agroecological farming systems as a function of the scientific and transformative goals at stake.

In this paper, we refer to design theories to analyze the place given to farmers and other stakeholders involved in farming system management in the design of agroecological farming systems. We first build an analytical framework based on the literature on design theories concerning co-design. The aim of the framework is to highlight the dimensions of a co-design process that needs to be analyzed to qualify the link between transformative goals of co-design and its real effects on the co-designers' work situations. We use this framework to analyze 39 participatory research projects on the design of agroecological farming systems. We characterize different approaches based on how the farmers and other stakeholders are involved in the design process and what effect their involvement has on their own situation of change and learning. Finally, we identify the conditions for a design approach likely to best support agroecological farming system development, and transformation of the place given to farmers in their design.

Materials and methods

Analytical framework

Analysing design theories, we identified four relevant dimensions to analyze the link between a co-design situation and its transformational effects (Table 1): who participates and who is considered to be a designer in the design process, what is the object of the design, the spatio-temporal dimensions of the design process, and lastly, how the design is implemented, mainly in terms of

knowledge management during the design process (referred as “who”, “what”, “where and when”, “how” in Table 1).

Table 1. Analytical Framework.

1- “Who” → Who participates? Who designs?
1.1. Who is considered to be the designer?
1.2. Who participates?
1.3. Who formulates the demand?
1.4. Is the demand discussed?
2- “What” → What is the object of design?
2.1. The design object: a technology / a place to facilitate exchange / a new workplace / a new design practice
2.2. Unpredicted output of design / what transformation is targeted in the real world?
2.3. Is the object of design discussed?
3- “Where and When” → Space and time dimension
3.1. Where does co-design take place? (in one or several places?)
3.2. Is the co-design considered as an ending process / an unending process?
3.3. Is the co-design considered as an iterative process, a disjointed process?
4- “How” → Design implementation in terms of knowledge management
4.1. What is considered as useful knowledge for the co-design process?
4.2. What place is given to a prototype / models / predictive tools?
4.3. What place is given to experiential knowledge/practical knowledge/sensitive knowledge?
4.4. Is learning an expected effect of design? (Action oriented design)
4.5. What is the role of consensus?
4.6. Is space allowed for unexpected findings / controversies / debate?

“Who designs and who participates in co-design?” is an important question when the target of the design process is to transform practices and to enhance learning among participant. In fact, it is both a question of “who has something interesting to say?” and “whose transformation and learning is targeted?”. This question dates back to the origins of co-design in the 1970s. From a utilitarian point of view, co-design is seen as a way to develop technologies faster and better suited to consumer needs. In this case, the purpose is not to trigger learning and to empower the targeted users. The participants to be involved in the process are considered as consumers or “end-users”. The designers are those who lead the process, taking the consumers’ needs and potential uses into

account by involving “lead users” as expert representatives (Von Hippel, 1986). In a less participatory but more objective device, it takes the form of ethnographic approaches to better understand potential uses (Blomberg et al., 1993). Social learning and empowerment are at the heart of the democratic idealism that gave birth to co-design (Gregory, 2003). It aims at producing operational technologies to improve workers’ daily work by sharing decisions between workers, designers and managers about which technologies should be designed and for what uses (Kraft & Bansler, 1994; Schuler & Namioka, 1993). It leads to considering that the workers are designers, rather than only participants who express their opinion during the process of designing new technologies or practices they would then merely adopt. According to Engeström (2001) workers permanently re-design objects, instruments and practices in their work. Therefore co-design calls for freedom at work and a rearrangement of the work place to enable the workers to better express their creativity (Mumford, 1987). The development of co-design approaches and methodologies in more complex and open fields (e.g. socio-ecological transitions or natural resources management where boundaries of problems and situations to transform are fuzzy, and where there are no clear hierarchical relations between participants) transformed the question of who is co-designer into the question of who should take part in and transform its practices through a collective design process (Couix, 1997; Grove et al., 2015)

The object of design should be of great concern because co-design processes are usually focused on designing a tangible artifact. Transformational change and learning are not usually an issue in such design even if the artifact causes huge changes in the user’s life. They are more likely to be an issue in co-design when the aim is to design a new practice or a new way of working together. The function of the design object could be clearly identified at the beginning of the design process or be unknown and be defined during the course of the design process. That was the case of the development of an environmentally friendly and economical car by the R&D service of a European car manufacturer (Elmquist & Segrestin, 2009). In other cases, the object could be the design process itself, for example the design of an enabling platform to sustain social innovation (Seravalli, 2011). The different natures of the object led to different forms of cooperation with different actors involved in co-design processes. Product design aims to create a tangible artifact to fulfil a function that is clearly identified at the beginning of the design process. The aim of having the users participate is thus to ensure a better match between the artifact and the intended function. The users are chosen for their ability to test the artifact and contribute their experiential knowledge to the design process. The function and the artifact could be both the object of design that uses creative methods, such as innovative design (Le Masson et al., 2010). The co-designers are then selected for their creativity, which is based on their whole culture and experience. They could tackle what

Sanders calls the fuzzy front ends of innovation (Sanders & Stappers, 2008). Several authors have shown that the process of design continues in the situation in which designed artifacts are put to use (Garud et al., 2009; Simon, 1997). As pointed out by Ehn (2008) "envisioned use is hardly the same as actual use, no matter how much participation there has been in the design process". Users adapt artifacts and/or create new functions for them. Acknowledging the extension of the design process to its use situation gets designers to work on unfinished artifacts that can be customized and completed by the users to better match their own needs, for example the possibility to customize a pair of shoes to one's own taste in terms of size, color, etc. before making the purchase (Daaboul et al., 2011). In its most radical form, this awareness has led to the entangled concepts of "Design to design" and "Metadesign". "Design to design" (also referred to as continuous design, redesign, unfinished design, collective resource approach, etc.) is to design set ups that help people to design what they want by themselves (Ehn, 2008).

The time and place for the co-design process is of great importance to address transformation and the learning effects of co-design because there can be desynchronization between collective work and their transformation and learning effects. The time and space dimensions of co-design differ, in particular, according to how the relationship between design and use is handled. Co-design can be managed as a process in which several people with different competencies and perspectives co-design something at the same time and in the same place, or alternatively, as a process in which different designers have a part to play but at different times and in different places. What is more, both cases may apply at different stages in the same co-design process (Couix, 2002). For example, during the design of common working procedures to prevent forest fire by forest managers in the Cevennes region in France, managers had to reach a shared understanding of the problem to coordinate themselves and to develop new working procedures for their own individual activity (Couix, 2002). All design processes converge at a certain point, and action and experimentation continues during practice and use, which make design partly an individual experience that users/workers encounter in everyday practice. Béguin (2007) mentions the synchronized development of artifacts and activity and the need to see work places and everyday practice as places where part of the design takes place. Other authors focused on the definition and characterization of collective places to stimulate reflexivity and coordination between actors, as motors of creation and of the development of individual and collective innovation (Albaladejo et al., 2010; Cantù et al., 2012; Couix, 2002; Gorli et al., 2015; Nevens et al., 2013; Voogt et al., 2015). Co-design can then be best represented as the articulation of collective thinking and production of artifacts, and individual action and experience. According to Darses et al. (2000), this articulation calls for the organization of two types of synchronization at the collective level: cognitive synchronization

(to agree on ends) and operational synchronization (to agree on means). Avenier refers to an iterative and never ending-process in which adjustment and new discussion of means and ends should constantly recur, and which should integrate unpredictable events and findings in the co-design process (Avenier, 2010).

"How" to implement co-design in terms of knowledge management is an important aspect of co-design to clarify its goals (scientific knowledge production, production of artifacts, practical changes, learning, etc.) and its means regarding the types of knowledge and the modes of knowledge production considered relevant to reach these goals. According to the classical view of industrial design in which designers design things for users' uses, designers consider that the appropriate knowledge about the objects to be designed is technical and scientific and that they are experts on their uses (Midler & Lenfle, 2014; Muller et al., 1991; Von Hippel, 1986). To take a more social view of design, for example, for the co-design of urban transition, the focus is more on building a consensus among the participants on what change should be targeted. These types of approaches consider the building of a shared view among the participants as the first step in being able to engage in practice transformation (Cantù et al., 2012; Nevens et al., 2013). In that perspective, some researchers propose to mobilize actors' experience as a source of professional development and learning in a particular enterprise or sector (Béguin et al., 2012; Engeström, 2001; Gorli et al., 2015), while others suggest involving a wide range of competences and perspectives in co-design processes, to stimulate creativity, learning, coordination and intersubjectivation (Couix, 2002; Couix & Hazard, 2013; Steyaert et al., 2016). Some authors point out that the real challenge is not to reach a consensus but to constructively deal with conflicts (Dewey, 1927) to overcome contradictions, that will allow us to think of the two aspects simultaneously (dialectical logic). Finally, in action and work centered design approaches, the question is not only what knowledge should be mobilized, but how to create the conditions to practice learning, both at collective and individual levels. To be able to design new individual and collective action, we need to learn about one's own practices and about those of others (Avenier, 2010).

Choice of articles

Thirty nine papers illustrating the diversity of the participatory design of agroecological farming systems were selected (Table 2).

Table 2. List of the 39 papers selected for the analysis.

N°	Authors / Years	Concepts	Objective of the paper – Interest with respect to our study
1	(Blazy et al., 2009)	Prototyping with expert, Sustainable Farming Systems	Proposal for a methodology to design crop management system prototypes that are compatible with a large number of farm types. Experts are involved in the second round of design whose aim is to adapt the first prototype farm types.
2	(Le Gal et al., 2009)	Participatory design, Sustainable Farming Systems	Proposal for a conceptual model based on three sub-systems to experiment and for ex ante evaluation of scenarios of change at farm scale, including a reflection on the advantage of involving stakeholders in the design process.
3	(McCown et al., 2003)	Participatory experiments Design, Sustainable Farming Systems	Case study on the value of a 10-year experiment in using a science-intensive cropping system simulator to test "virtual experiments" with farmers and their advisors. Provides an understanding of the interest of simulation to support redesign.
4	(Moraine et al., 2017)	Participatory Design, Sustainable Farming Systems	Proposal for a conceptual framework to address crop-livestock interactions at the territory level and use of this framework to co-design scenarios of new crop-livestock interactions at the territory level with farmers to work on the changes they can make at farm level.
5	(Murgue et al., 2014)	Participatory Design, Sustainable Farming Systems	Proposal for a problem oriented methodology to design and evaluate alternative agro-hydro systems using modeling and participatory approaches involving farmers and other agro-hydro system experts. Scenarios include changes in crop spatial distribution and uses.
6	(Albicette et al., 2017)	Co-innovation, Sustainable Farming Systems	Application of co-innovation approach to improve the sustainability of livestock family farms in Uruguay, involving farmers, regional actors of farming system management and research teams.
7	(Delma et al., 2016)	Participatory Design, Sustainable Farming Systems	Proposal for a design and support approach to develop family livestock projects involving a farmer and an adviser throughout the process.
8	(Barcellini et al., 2015)	Participatory Design, Sustainable Farming Systems	Analysis of the different forms of participation during the participatory design process of a software to assess the sustainability of agricultural cropping systems.
9	(Dabire et al., 2017)	Co-Innovation, Farming systems, Agroecology	Case study of the interest of the development of an innovation platform to promote ecological intensification. Involvement of farmers, advisors and other agricultural actors in the development and implementation of experimentation and research on conservation agriculture.
10	(Navarrete et al., 2010)	Participatory Design, Farming Systems, Innovation with experts. Evaluation tool.	Proposal for a methodology to design alternative cropping systems with expert advisers using a qualitative evaluation tool.
11	(Le Bellec et al., 2012)	Co-design, Sustainable Farming Systems	Proposal for and implementation of a method to design and assess innovative farming systems that uses a three loop (field, farm, regional) scale and involves farmers, researchers and agricultural advisors.
12	(Coquil et al., 2014)	Step-by-Step Design, Sustainable Farming Systems	Case study of a long term experiment on an experimental farm for the step by step development of a more self-sufficient farming system. The paper analyzes the role of farm managers in the way the experiment is oriented and managed, linked with the local conditions as they perceive them.
13	(Sautier et al., 2017)	Participatory Design, Sustainable Farming Systems	Proposal for a participatory design method supported by an existing farming system modeling and simulation game to design and evaluate adaptations of livestock systems to climate change with farmers.
14	(van Dijk et al., 2017)	Co-innovation, Sustainability, Farming Sector	Proposal for a participatory facilitation framework and tools for a practice-led collaborative innovation process.
15	(Lefèvre et al., 2014)	Participatory Design, Organic Farming Systems	Proposal for and application of a method to help farmers in the design of innovative prototypes of organic cropping systems, based on several design workshops with farmers.

16	(Moraine et al., 2014)	Participatory Design, Farming Systems, Agroecology	Proposal for and implementation of a participatory methodology to design integrated crop-livestock systems at field, farm, and territory levels, using a conceptual model as a boundary object and a multi-criteria assessment tool to evaluate the different prototypes and options designed.
17	(Martin et al., 2011)	Participatory Design, Farming Systems, Climate Change	Case study of the use of a modeling based board game with farmers and their advisers to support participatory workshop reflection on the adaptation of livestock systems to climate change.
18	(Vänninen et al., 2015)	Co-innovation, Activity Theory, Farming Systems, Integrated pest management	Analysis of how the management of a change in laboratory methodology supports the redesign of farmers' activity regarding pest management in a local community of greenhouse farmers and firms.
19	(Reau et al., 2012)	Collective Design of Prototypes	Analysis of the different functions in a group of designers in the case of the design and assessment of innovative cropping system prototypes.
20	(Botha et al., 2014)	Co-innovation, Agricultural system	Analysis of the main challenges to the management and operationalization of innovation platforms and co-innovation based on a transdisciplinary research and development program in the New Zealand dairy sector. The way to set up collaboration between farmers, researchers and other actors is addressed.
21	(Groot Koerkamp & Bos, 2008)	Reflexive and Integrated approach, Farming systems	Presentation of the Reflexive Interactive Design approach and of its application to reform dairy production systems for more sustainability.
22	(Gariepy et al., 2016)	Participatory modelling and design, Agricultural Watershed management	Proposal for a participatory modeling approach as a tool for sharing the points of view of researchers, farmers and other practitioners to define scenarios of change for agricultural farming systems in the same farming territory.
23	(Dogliotti et al., 2014)	Co-innovation, Farming systems	Case study of a project based on a co-innovation approach to the diagnosis and re-design of farming systems in collaboration with farmers and their advisers based on on-farm experimentation and a multi-year production schedule.
24	(Casagrande et al., 2015)	Participatory Design, Organic Farming Systems	Analysis of two situations of co-design of organic farming system ideotypes relying on the principles of conservation agriculture, with farmers and experts, to understand the role of researchers, experts and farmers in the process.
25	(Mapfumo et al., 2013)	Co-design, Participatory Action Research, Farming Systems, Climate Change	Case study of participatory action research in Zimbabwe and Ghana where the action research is coupled with the design of farmer field-based learning centers to build their adaptive capacity to climate change.
26	(Naivinit et al., 2010)	Co-design, Companion modeling, Rice production systems	Case study of the process of co-design of a water management model of lowland rice production in Thailand with farmers, using the companion-modeling method. The analysis shows how the process helped farmers strengthen their adaptive ability to manage water on their farm.
27	(Triomphe et al., 2008)	Co-design, Agricultural Watershed Management	Case study of a project involving local stakeholders of the Brazilian *Cerrado* to design direct seeding techniques and milk marketing strategies using a focus group approach.
28	(Schaap et al., 2013)	Participatory Design, Farming Systems, Climate Change	Case study of the co-design of strategies for adaptation to climate change using modeling and participatory design with stakeholders of the Flevoland in the Netherlands.
29	(Gouttenoire et al., 2013)	Participatory Modelling to help re-design; Farming Systems, Sustainability	Co-design of a conceptual model of livestock farming systems at farm scale with farmers implementing re-design toward agroecology on their own farm. The aim is both to create an innovative and relevant conceptual model that renews the ones used by animal scientists and to support farmers' learning processes.
30	(Bos et al., 2009)	Reflexive interactive design; Dairy system innovation; Sustainability	Case study of the Reflexive Interactive Design methodology in a participatory project to support the design of sustainable husbandry systems for dairy cows in the Netherlands.
31	(Vall et al., 2008)	Co-design; Farming Systems, Sustainability	Proposal for a participatory action research framework to co-design innovative technical practice with farmers, based on a case study with farmers in Burkina Faso to co-design agro pastoral innovations.
32	(McKee et al., 2014)	Interactive Design, Collaborative	Study of the envisioning process in the case of the interactive collective design of innovation for reaching sustainable

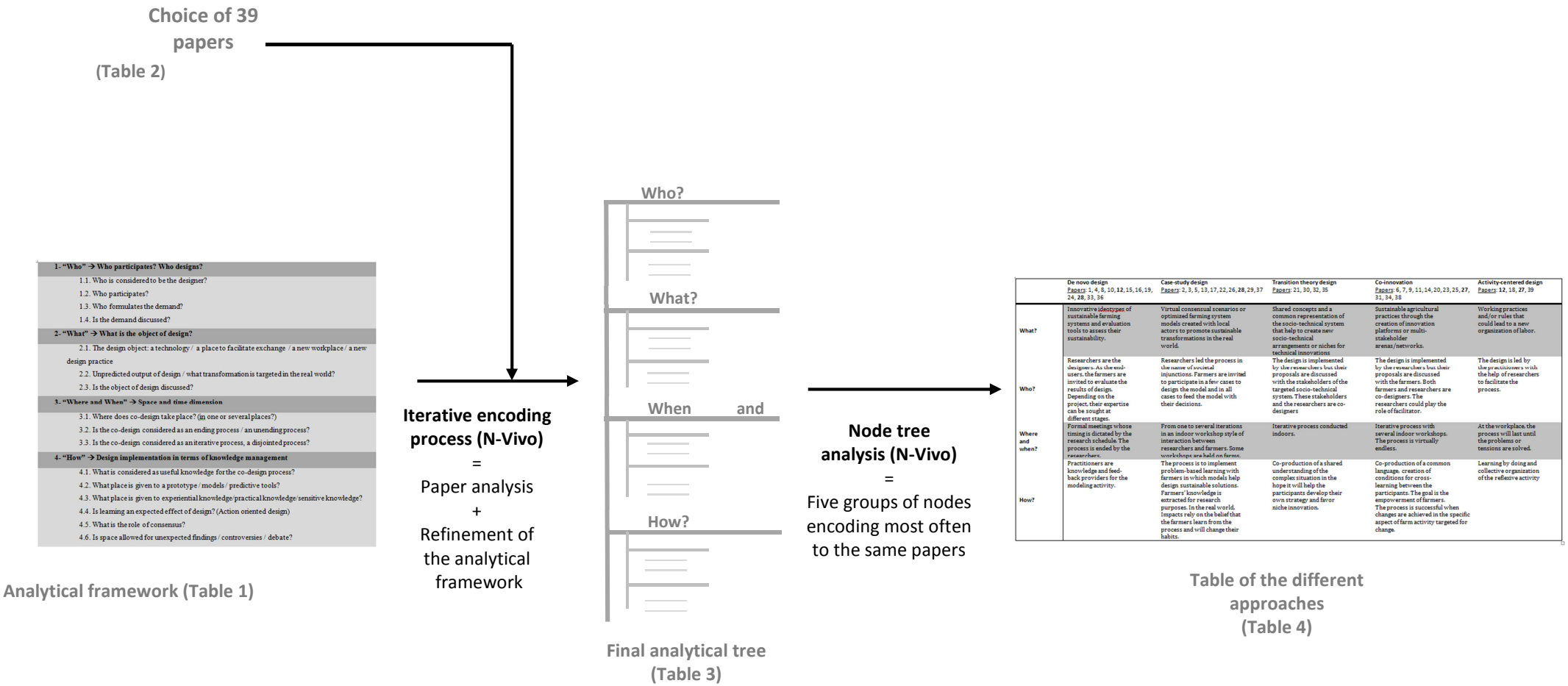
		envisioning, Sustainable Agriculture	agriculture at regional scale of the case of two projects, one in in North East Scotland and one in Southern Portugal.
33	(Penvern et al., 2012)	Participatory Modelling and Design, Re-design, Sustainable Farming Systems	Proposal for a methodology involving fruit producers, advisors and agricultural scientists to co-design and evaluate ex-ante sustainable orchards ideotypes.
34	(Tittonell et al., 2012)	Co-innovation; Cropping Systems, Agroecology	Case study of a project to develop conservation agriculture in Africa using a co-innovation platform methodology with local stakeholders.
35	(Elzen & Bos, 2015)	Reflexive Interactive Design; Sustainable Production Systems	Discussion of the Reflexive Interactive Design methodology to foster niche innovation in the sector of sustainable animal production through the study of several cases that implemented this methodology in the Netherlands.
36	(Murgue et al., 2015)	Participatory Design, Sustainable Agricultural Landscapes	Presentation of a methodology to design with stakeholder's alternative agricultural landscape in a watershed facing quantitative management issues.
37	(Giller et al., 2011)	Participatory design, Simulation, Crop-livestock systems	Presentation of the NUANCES models as a tool to identify best-fit technologies for African farmers for the efficient use of nutrients at farm scale. The model was developed involving farmers' local knowledge.
38	(Botha et al., 2017)	Co-innovation, Agricultural System Innovation	Discussion of the co-innovation methodology as a catalyzer of practice led innovation and farmer's learning by analyzing the process of different co-innovation projects.
39	(Hill et al., 2007)	Co-design, Activity Theory, Apple industry network	Description of the process of change in a laboratory learning to develop and implement innovative labor management practices in the apple industry and farming sector in New Zealand.

First, in October 2017, we identified 923 papers published in scientific journals or conference proceedings by searching Google Scholar using the following algorithm: (“co-design” or “participatory design” or “co-innovation”) and “farming systems” and “sustainability”. We chose "sustainable" as it was more inclusive than "agroecology" which appeared too restrictive with respect to the range of co-design methods implemented to improve the sustainability of farming systems. Next, the titles and abstracts of all these articles were analyzed to keep only the papers on farming systems that addressed issues at the territory, farm or cropping system level but which developed a design approach with an explicit transformative agenda for farmers’ practices and work situations. Last, since several papers may be published concerning a single research project, we selected what we considered to be the most detailed and relevant paper per research project with respect to our inquiry.

Literature coding and analysis

We present the different steps of the analysis we performed on the 39 papers in Figure 1.

Figure 1. Diagram of the encoding and analytical process of the literature



	De novo design Papers: 1, 4, 8, 10, **12**, 15, 16, 19, 24, **28**, 33, 36	Case-study design Papers: 2, 3, 5, 13, 17, 22, 26, **28**, 29, 37	Transition theory design Papers: 21, 30, 32, 35	Co-innovation Papers: 6, 7, 9, 11, 14, 20, 23, 25, **27**, 31, 34, 38	Activity-centered design Papers: **12**, 18, **27**, 39
What?	Innovative ideotypes of sustainable farming systems and evaluation tools to assess their sustainability.	Virtual consensual scenarios or optimized farming system models created with local actors to promote sustainable transformations in the real world.	Shared concepts and a common representation of the socio-technical system that help to create new socio-technical arrangements or niches for technical innovations	Sustainable agricultural practices through the creation of innovation platforms or multi-stakeholder arenas/networks.	Working practices and/or rules that could lead to a new organization of labor.
Who?	Researchers are the designers. As the end-users, the farmers are invited to evaluate the results of design. Depending on the project, their expertise can be sought at different stages.	Researchers led the process in the name of societal injunctions. Farmers are invited to participate in a few cases to design the model and in all cases to feed the model with their decisions.	The design is implemented by the researchers but their proposals are discussed with the stakeholders of the targeted socio-technical system. There stakeholders and the researchers are co-designers	The design is implemented by the researchers but their proposals are discussed with the farmers. Both farmers and researchers are co-designers. The researchers could play the role of facilitator.	The design is led by the practitioners with the help of researchers to facilitate the process.
Where and when?	Formal meetings whose timing is dictated by the research schedule. The process is ended by the researchers.	From one to several iterations in an indoor workshop style of interaction between researchers and farmers. Some workshops are held on farms.	Iterative process conducted indoors.	Iterative process with several indoor workshops. The process is virtually endless.	At the workplace, the process will last until the problems or tensions are solved.
How?	Practitioners are knowledge and feed-back providers for the modeling activity.	The process is to implement problem-based learning with farmers in which models help design sustainable solutions. Farmers' knowledge is extracted for research purposes. In the real world, Impacts rely on the belief that the farmers learn from the process and will change their habits.	Co-production of a shared understanding of the complex situation in the hope it will help the participants develop their own strategy and favor niche innovation.	Co-production of a common language, creation of conditions for cross-learning between the participants. The goal is the empowerment of farmers. The process is successful when changes are achieved in the specific aspect of farm activity targeted for change.	Learning by doing and collective organization of the reflexive activity

First, we performed a semi-structured analysis of content (Fereday & Muir-Cochrane, 2006). The encoding process was based on the categories of our analytical framework: for each paper, we qualified each category of our framework ("who", "what", "where and when", "how", see Table 1) using an iterative encoding process with N-Vivo Software (Bazeley & Jackson, 2013). We obtained an analytical tree with three levels of branches: the two first corresponded to our framework and the last corresponded to the occurrences we found as a result of encoding the papers (Table 3).

Table 3. Final analytical tree (Lines in grey correspond to our framework, lines in white are the occurrences we defined while encoding the papers).

1. Who designs – Who participates?
1.1. Who is designer?
End users
Practitioner
Researchers
Stakeholders
1.2. Who participates?
Future potential expert users
Practitioner as knowledge providers
Researchers facilitate the process
Stakeholders give their opinion
1.3. Who formulates the demand?
Where does the demand come from?
Farmers
No information
Society
Who formulated the original demand?
Practitioners
Researchers
1.4. Is the demand discussed?
Iterations after researchers' proposal
Iterations from the beginning of the process
No discussion
2. What is the object of design?
2.1. Design Object
Agricultural practices-Cultural Techniques
Shared representation of the situation of the socio-technical system
Farming system evaluation software
Farming system prototypes / ideotypes
Hybrid knowledge about farming systems
Innovation platforms – centers
Models of farming system functioning
Multi-stakeholder arenas – networks
Scenarios of change
Shared concepts

Working practices - Working rules
2.2. Transformation targeted in the real world
New organizational arrangements and rules
None
Practice innovation
Redesign of farming systems
Stakeholder empowerment
Technical innovations
2.3. Discussion of object
Discussion of researchers' proposals
No discussion
Permanent discussion of the object of design
3. Spatio-Temporal Dimensions
3.1. Where does co-design take place?
Indoors and on Experimental stations
Indoors and at the place of work
Indoors only
3.2. Is the co-design considered as an ending process / an unending process?
Ending process
Research time
Unending process
3.3. Is the co-design considered an iterative process or a disjointed process?
Disjointed process
Iterative process
4. Knowledge Management
4.1. What is considered as useful knowledge for the co-design process?
Expert knowledge / Technical knowledge
Local constraints
Scientific knowledge
Socio-technical arrangements
4.2. What place is given to a prototype / models / predictive tools?
Scenarios are validated by stakeholders
Models are used to simulate changes
4.3. What place is given to experiential, practical, sensitive knowledge?
Experience sharing is important
Practitioners'-Users' Knowledge is important
Stakeholders' knowledge about their territory is important
4.4. Is learning an expected effect of design? (Action oriented design)
Learning is targeted by the design
Action oriented design (more than knowledge oriented design)
4.5. What is the role of consensus?
Reaching consensus between researchers and stakeholders is an objetive
4.6. Is space allowed for unexpected findings / controversies / debate?
Controversial elements (that invite debate) are important

We then explored the tree using the analytical functions of N-Vivo to see which occurrences in our analytical tree often encoded the same papers (Diagram Tree Function of N-Vivo, see Bazeley & Jackson, 2013). This analysis sorted the occurrences into five groups as a function of their proximity during coding, meaning that if two occurrences were often encoded together in the same paper, they had more chance of being part of a group of occurrences associated with a specific group of papers. This allowed us to identify five main approaches within research projects as a function of their main characteristics in our analytical framework (Table 4).

Results

Using the analytic framework, the papers on the participatory design of agroecological farming systems were categorized in five approaches (see the analytical process in Figure 1): “De-novo design” (12 papers), “Case-study design” (10 papers), “Niche innovation design” (4 papers), “Co-innovation” (12 papers), “Activity centered design” (4 papers) (see Table 4). Three papers were common to two different approaches.

Table 4. Tables of the different approaches we identified and their main characteristics with respect to our framework. Each approach corresponds to a specific combination of the occurrences for the criteria used in our conceptual framework. Some references were half way between two categories. Their numbers are in bold and they were sorted into two categories.

	De novo design Papers: 1, 4, 8, 10, **12**, 15, 16, 19, 24, **28**, 33, 36	**Case-study design** Papers: 2, 3, 5, 13, 17, 22, 26, **28**, 29, 37	**Niche innovation design** Papers: 21, 30, 32, 35	**Co-innovation** Papers: 6, 7, 9, 11, 14, 20, 23, 25, **27**, 31, 34, 38	**Activity-centered design** Papers: **12**, 18, **27**, 39
What?	Innovative ideotypes of agroecological farming systems and evaluation tools to assess their sustainability.	Virtual consensual scenarios or optimized farming system models created with local actors to promote agroecological transformation in the real world.	Shared concepts and a common representation of the socio-technical system that help create new socio-technical arrangements or niches for technical innovations	Agroecological practices through the creation of innovation platforms or multi-stakeholder arenas/networks.	Working practices and/or rules that could lead to a new organization of labor.
Who?	Researchers are the designers. As the end-users, the farmers are invited to evaluate the results of design. Depending on the project, their expertise can be sought at different stages.	Researchers lead the process in the name of society. Farmers are invited to participate in a few cases to design the model and in all cases to feed the model with their decisions.	The design is implemented by the researchers but their proposals are discussed with the stakeholders of the targeted socio-technical system. These stakeholders and the researchers are co-designers	The design is implemented by the researchers but their proposals are discussed with the farmers. Both farmers and researchers are co-designers. The researchers may play the role of facilitator.	The design is led by the practitioners with the help of researchers to facilitate the process.
Where and when?	Formal meetings whose timing is dictated by the research schedule. The process is ended by the researchers.	From one to several iterations in the form of indoor workshops for interaction between researchers and farmers. Some workshops are held on farms.	Iterative process conducted indoors.	Iterative process with several indoor workshops. The process is virtually endless.	At the workplace, the process will continue until the problems are solved or the tensions alleviated.

How?	Practitioners are knowledge and feed-back providers for modeling.	The process is implementing problem-based learning with farmers in which models help design agroecological solutions. Farmers' knowledge is extracted for research purposes. In the real world, impacts rely on the belief that the farmers learn from the process and will change their habits.	Co-production of a shared understanding of the complex situation in the hope it will help the participants develop their own strategy and favor niche innovation.	Co-production of a common language, creation of conditions for cross-learning between the participants. The goal is the empowerment of farmers. The process is successful when changes are achieved in the specific aspect of farm activity targeted for change.	Learning by doing and collective organization of the reflexive activity

De-novo design

De-novo design refers to a group of researchers whose work is mainly rooted in the C-K theory of innovative design (Le Masson et al., 2010), and whose aim is to design innovative cropping system prototypes.

In De-novo design, researchers create ideotypes, conceptual maps or computerized models of farming systems from scratch, with the help of farmers and other stakeholders. Participants are chosen by the researchers for their expertise and for themselves being innovative so they will not be too conservative in the process. The level of involvement in the process of the participants varies. At the lowest level, they are invited to evaluate the designed ideotypes (Reau et al., 2012). In a few cases, they participate in the creation of evaluation tools to choose the appropriate evaluation criteria for different innovative prototypes (Barcellini et al., 2015). In a more participatory way, they may be consulted to define objectives for the prototype to be achieved or to evaluate the scenarios (Navarrete et al. 2010), to share their knowledge with researchers at the different steps of the process when the process is building the model (Moraine et al. 2015), or to help researchers create new combinations of practices that are relevant and innovative from their point of view (Lefèvre et al., 2014; Penvern et al., 2012).

The way farmers implement and adapt what they learn on their own farm is not considered to be part of the design process (Murgue et al., 2015), nor usually, is the context in which the evaluation software is used (Cerf et al., 2012). The design process ends when the designed object is considered to have achieved the goals the researchers laid down for the design (Lefèvre et al., 2014).

The aims of De-novo design are to produce relevant and innovative knowledge and system ideotypes to inform policy and decision makers on the innovation to support or adopt. Learning and transformation are considered more as spin offs of the work rather than as a desired result (Murgue et al., 2015).

Case study Design

In Case study design, the aim is to invite farmers and other stakeholders to examine a case study that involve the design of a scenario of changes in a farming system. This exercise is supported by modeling. The aim is to engage farmers in reflexivity by simulating the possible impact of the decisions they may take (Martin et al., 2011; Sautier et al., 2017) and/or to facilitate collective learning among the farmers by representing their view of a situation (Barnaud et al., 2008; Gouttenoire et al., 2013).

Conceptual or computerized models of farming systems management and functioning are designed by researchers (Martin et al. 2011; Sautier et al. 2017). These models are used in simulation workshops in which the farmers are invited to play their own roles and take virtual decisions. The objective is to evaluate the impact of different decision scenarios on changes in farming systems. Some authors argue for the need to build the conceptual model in collaboration with the actors, as a way of building a shared view of the boundaries of a problem and of empowering people in the design of scenarios of change (Simon & Etienne, 2010) or of promoting collective thinking (Lucie Gouttenoire et al., 2013). However, aggregation, decisions and representation rules of the computerized modelling tool are mostly decided by modelers, who, in the majority of cases, are the researchers.

The models may be designed at the farm or regional scale. At the farm scale, this allows farmers and their advisors to test and discuss the consequences of different scenarios of change, under conditions that are close to their own (Martin et al., 2011; Sautier et al., 2017). At regional scale, it creates a common understanding of a problematic situation and helps stakeholders to collectively envisage brakes and levers to improve it, which might include changes in farmers' practices (Barnaud et al., 2008). When researchers organize collective workshops with farmers and other stakeholders, they play the role of facilitator.

Most of the collective work is organized by researchers in the form of indoor workshops (Sautier et al,. 2017; Gouttenoire et al., 2013). These workshops may be held on the participants' farms or in their villages (Barnaud et al., 2008; Martin et al., 2011), whereas in other projects, there is no mention of where the workshops are held. Modeling processes by researchers and collective workshops with farmers are generally separated in time and in space (Martin et al, 2011; Sautier et al., 2017), except in a few cases in which designing the model is part of the collective process. In those cases, there are iterations between the workshops where the model is co-designed and the lab where the modelling and computer system development takes place.

The aim of interacting with the farmers is primarily extracting knowledge that is useful for the modelers' work. However, in most cases, the researchers hope that the farmers and their advisors will learn from the workshop sessions. They hope that reaching a consensus on the best options and scenarios for change in the workshops will trigger the re-design of farming systems or the creation of territorial synergies. However, there is little information in the papers on how the participants implement what they learn and on the impact of the workshop in the real world.

Niche innovation design

Niche innovation design is an approach led by a group of researchers located in the Netherlands (Bos et al., 2009). They developed a methodology called reflexive interactive design (RIO) to design innovations at farm scale, for instance, an innovative farm building that enables significate improvement to animal welfare. Their work is rooted in transition studies and socio-ecological theories (Geels & Schot, 2007). This design process aims to produce niche innovation products at farm or market level.

The design process follows different steps in which the object of design differs: first, the socio-economic system representation in which the innovation design process will take place, is defined. Defining the socio-economic system is a way of getting a clear idea of who the actors of the dominant and alternative regimes are (Geels & Schot, 2007) and of how they interact. Then, the importance of achieving new rearrangements of this system is underlined, which means new practices of cooperation and interaction between actors. The process ends when the new rearrangements lead to a niche innovation in the socio-ecological system, e.g., if the manufacturer and sellers of farm buildings have achieved a level of coordination with some farmers and local actors that allow the installation and testing of a prototype building on a farm.

According to the authors, achieving niche innovations (Geels & Schot, 2007) is hard because of the difficulty of keeping people involved from the beginning to the end of the process, which is very time demanding. The design process is iterative and ends when a prototype of the product is installed on a farm, but the way this innovation transforms the farmer's activity, or the way he/she adapts his/her practices and the new innovation is disseminated to other farms is not considered to be part of the design process (Elzen & Bos, 2015). In the end, the process relies mainly on indoor workshops, not on the farms.

Learning about other participants' views, opinions and expectations, as well as building a consensus on how reach more agroecological farming systems are clearly targeted in the process. Actors are also invited to participate thank to their expertise on specific aspects or elements of the systems. However, the papers provide little feedback about how individuals use what they learned during the collective process to transform their own practices.

Co-innovation

Co-innovation aims at producing practice-led innovations to support farmers' empowerment in agroecological transition pathways through participatory action research. Researchers design specific arenas for farmers to take part in the design of practice-led innovations. Two streams can be

distinguished within this approach with respect to the type of arenas researchers design and manage. The first stream focuses on the design and management of innovation platforms or training centers, i.e. physical locations for meetings, discussion and co-innovation with farmers and other stakeholders (Pound & Posthumus, 2016; Tittonell et al., 2012). The second stream focuses more on the design and management of farmers' networks as an immaterial system of co-innovation (Botha et al., 2014, 2017; Van Dijk et al., 2017). In both cases, the final goals are the empowerment and action capacity building of the stakeholders, to enable them to learn and develop innovative practices or collective organizations that will support more agroecological practices.

The researchers formulate and lead the project, although the goals for change are open to discussion right from the beginning (Botha et al., 2014). Farmers and other stakeholders get together and discuss innovative solutions within the framework designed and managed by the researchers. The researchers organize reflexivity on the management of the collective process among interdisciplinary action research teams. In some projects, researchers hire facilitators to facilitate the co-innovation process between stakeholders (Van Dijk et al., 2017).

In these approaches, co-innovation is acknowledged to be a never-ending and non-linear process. However, sustaining the process over time may prove to be difficult for researchers: the project is usually not funded for long enough for changes in farmers' practices to be observed, and, under these circumstances, it is difficult to maintain and extend farmers' participation and empowerment (Pound & Posthumus, 2007).

The aim is clearly to produce knowledge that will be useful for farmers to enable them to adopt new practices and techniques in their own context, and to guide them in their understanding and use of this knowledge. Farmers' learning is clearly targeted by researchers. However, projects usually focus one aspect of farm activity and do not promote collective discussion about the type of farming system to be achieved: for example, a project about conservation agriculture in which the use of pesticides is not part of the collective discussion, even though it represents an additional cost for farmers and pesticides could affect their health in the long run (Dabire et al., 2017). The co-innovation process is successful if changes are achieved in the specific aspect of farm activity that has been targeted for change. Still, some researchers highlight the relevance of such approaches to reach new local arrangements between farmers or between farmers and advisers (Botha et al., 2017; Triomphe et al., 2008).

Activity-centered design

Activity-centered design was developed by a Finnish team and is based on activity theories (Engeström, 2001). Here, the researchers aim to help local groups of farmers or a farming sector to solve a structural problem related to their activity; for example, a problem of the use of illegal labor in the apple industry in New-Zealand (Hill et al., 2007) or a problem of pest management in a group of farmers (Vänninen et al., 2015). Researchers support re-design by mediating a learning process based on the debate between individuals in the same local activity system about how to improve their situation and what solution to implement to solve their problems. What they call a local activity system corresponds to farming practices, but also to a system of references, norms and instruments a group of farmers use to design their own actions and make their own choices in their work situations (Engeström, 2001).

The object of design is at the same time individual and collective activities that have a direct impact on the individual activity. What are designed are new rules, instruments, or arrangements for farming activities. Researchers start from a local farmer's demand. The difference between this and the previous approach is that it explicitly aims at triggering both individual and collective change within the activity system, so that the changes can be sustained when the researchers leave. For example, in the case of the project to address the issue of local integrated pest management with a group of horticultural producers, the process was facilitated right from the beginning in collaboration with local advisers, and during the process, the question of how to continue the facilitation after the project was addressed both logistically and economically. At the same time, participants build a new collective representation of their pest management problem and took concrete action to test new models of pest management and transform their practices (Vänninen et al., 2015).

The design process is considered as never ending as long as the farmers consider their problem is not yet solved and the object of design is discussed throughout the process. Design is considered to take place both during collective meetings in dedicated collective work spaces and at individual workplaces on informal occasions. In that sense, the process is iterative and should continue until the tensions in the system are resolved. This process takes place directly within the farmers' and other stakeholders' work environments and the focus is on contradictions in views and ideas concerning individual and collective practices.

By helping participants express and share these contradictions, researchers facilitate the creation of new rules and of useful resources to help participants improve individual and collective practices by themselves (Hill et al., 2007). For example, one of the outcomes of the project with horticultural producers facing a pest management problem was the creation of a new collective perception of the

pest management problem at the scale of the local community and drawing up procedural rules to implement new integrated management techniques on farms. In this approach, farmers and other stakeholders of the activity system need to be at the origin of the demand and willing to engage in the process of changing their own practices. Among the limitations of this approach is the fact that it can be hard to get stakeholders from the same activity system but with very different perspectives and interests together around the table, and may require organizing different Change Laboratory arenas to be able overcome conflicts and power games (Vänninen et al., 2015). Controversial elements within the activity system and their expressions are central to the development of this kind of process. However, limiting the system to the activity system can exclude from debates and changes stakeholders who are interested in the farming activity but who are not actually workers in the sector concerned, for example consumers or environmental associations, who may be interested in participating in local discussions about farming system transformations, but are not considered as farmers' peers. The process is action oriented in the sense that it brings about direct changes in participants' practices and organizations, mainly through learning by doing, experience sharing and reflexive discussions about their own individual and collective contradictions.

Discussion

Participatory design involving both researchers and farmers is considered as a way to improve both the relevance of the scientific knowledge produced and the efficiency of farmers' innovation processes. Regarding to the development of agroecology, what is at stake in these processes is supporting the development of the farmers' role in the innovation, supporting the transformation of their way of reasoning, and creating and validating new farming practices with them. Our study of the different existing approaches to the participatory design of innovative farming systems proves this stake is rarely considered as a whole. Researchers focus on results in terms of the knowledge that has been created rather than the outcome of the participatory process for farmers. Moreover, the relationship between the goal of participation and the way it is implemented is seldom discussed in scientific articles, nor is the transformative goals of the work. It is a limitation when willing to support the development of agroecology. It should be noted we only analyzed published scientific papers which probably led to a bias in our conclusions: farmer-led projects undoubtedly exist and some of them probably involve researchers as co-designers but they did not lead to scientific publications that were picked up by our algorithm. Moreover, the fact that scientists rarely report such changes in the papers they write, does not necessarily mean they never observe them, or take them into account in future work. Despite these limitations, our analytical framework, which derived from the analysis of participatory approaches in design theory, allowed us to identify five approaches

in farming system design. Coming back to the “who”, “what”, “where and when”, “how” questions of that framework allows us to infer the design practices that promote farmer’s learning and commitment to developing agroecology.

Sharing both the design work and the leadership

Even though farmers often participate in the design process, they are seldom invited as co-designers, which means their goals and desire for change are probably missing, and likely that of learning as well. In De novo design, Case study design and Niche innovation design, the farmers are involved in the process as future users of the product of design and usually only participate when the process is already well underway. Invitations are sent to innovative farmers, who are already advanced in the implementation of innovative practices on their farm and who are interested in working with scientists. This way of perceiving farmers is close to what Von Hippel calls “lead-users innovation process”, where participating users are there because they represent the user group as experts (Von Hippel, 1986). In Co-innovation and Activity-centered design, farmers and other stakeholders are part of the process right from the beginning and co-design aims to directly transform their farming systems and practices. In Co-innovation - unlike in Activity-centered design- although farmers participate fully in the design, they are not full empowered, since researchers are still the ones who lead the projects.

Taking into account the singularity of farmers’ situations

Only Co-innovation and Activity-centered design approaches directly target the re-design of farming activities and practices. The other approaches are centered on the design of specific objects (prototypes, computing models, evaluation tools) that are chosen as a function of the researchers’ objectives or expertise. The farmers’ goals and the concrete problems with which they have to cope in their individual situation are rarely taken into account when these objects are designed. The process of design usually stops when a consensus is reached on the relevance of the process outcomes (a relevant scenario of change, a relevant prototype, a relevant evaluation outcome). On the contrary, in Activity-centered approaches and Co-innovation, the design process is centered on producing agroecological changes within farming systems and on supporting the creation of local arenas to discuss and support these changes. However, we noted that this last objective is rarely debated with farmers and existing extension organizations. This raises the issue of the sustainability of these changes once the project is over, as well as the possibility of a mismatch between the changes implemented by participating farmers and the extension and production system that surrounds them.

Bridging thinking and doing in the design process

Except in the Activity-centered design approach, the place where co-designers organize, analyze or reflect on the design remains separate from the place where farmers think, organize and implement changes; i.e., between the collective work organized by researchers and the changes implemented by the farmers on their farms. This means that researchers cannot observe the changes in the farmers' real practices produced by the co-design process, or at least they do not consider them as useful feedback to continue the co-design process.

We also noted that, apart from Activity-Centered Design and some Case study design projects, collective work rarely takes place directly on the farms. The co-design process rarely pays attention to the farmers' individual trajectories and projects for change with the aim of better adapting co-design outcomes to the farmers' needs and expectations when they get involved. Finally, we observed that most projects are organized around researchers' schedules and space, since they are the ones who are organizing and leading the co-design process.

Organizing collective reflexivity to learn from the design process

The transformative goal is explicit in articles referring to Co-innovation and Activity-centered design and Niche innovation design, which makes them more support-oriented. In fact, they explicitly target situated learning of participants, in and through real practice and social experimentation. However in these approaches, how reflexivity is organized to foster learning among all the participants remains unclear, including by the researchers themselves who remain project leaders. What is more, there seems to be little concern about what happens when the researcher stops leading the project.

De-novo design and Case-study design are more research oriented. In De novo-design, the work is driven by the production of scientific knowledge. Empowerment and learning are not explicitly targeted. In Case-study design, the goal is to engage farmers in reflexive activity on a case study that may be theirs. From a scientific point of view, this makes it possible to better understand farmers' reasoning and to judge the relevance of the models and scenarios produced by researchers. From a transformative point of view, the idea is that this reflection will encourage farmers to question their practices when they return home. However, in this approach, the impact on effective changes on the farms is not part of the research project. There is therefore no evidence for this impact or that feedback will be reused in the design work.

Toward a situated co-design of farming system to foster agroecology

Research-oriented and support-oriented approaches remain clearly separated. However, we identified one case that relied on a mix between a research-oriented (De-novo design) and a support-oriented approach (Activity-centered design). This is the case of a project at the experimental station of Mirecourt in France (Coquil et al., 2014), which began when the entire team at the station, including scientists, technicians and the farmer manager decided together to lead the experimental farm toward self-sufficiency and organic farming. In the first stage, they used a De-novo method to collectively define the system prototype they wanted to implement and the specific dimensions of farming production they wanted to monitor as indicators of change. From that point, they tried to implement this farming system and to monitor how it changed over time. When the farm manager and the technicians encountered difficulties implementing the changes and adapting their activity to such changes, they organized a reflexive process including the scientists to adjust the prototype step by step to the organization of the real activity and issues. Of course, the process took place over a long period of time (over a decade), and is still ongoing today, so it obliged the scientists to consider a much longer time frame for research, which might not match the rhythm of research today. Despite the fact this specific case involved an experimental farm, it raises reasonable hope that it may be possible to better articulate research-oriented and support oriented approaches.

Finally, this literature review showed there is room to develop local participatory projects in which researchers and farmers are co-designers, and that aim to produce artifacts that can be directly used by farmers to re-design their own activity. From our point of view, the most engaging way to support the development of agroecology would be to involve all the participants of the activity system to be transformed (farmers, local stakeholders, including extension organizations and researchers) as co-designers. This implies that, at the very least, the farmers and other stakeholders are involved in the definition of the objectives of change right from the beginning, even initiate and carry out their own projects for change. Only in these conditions will the co-design process succeed in integrating real farm situations and existing local organizations (the farm, the local network of farmers, the local food system, etc.). In such a perspective, the object of co-design should be artifacts and resources that directly support individuals in the transformation of their own practices at farm and local scale. Participatory projects could then include among their tasks monitoring the changes they produce in the farming systems, to better articulate these changes with the collective design of relevant resources and of set-ups to support them.

In future, to support the development of agroecology, we suggest exploring some specific streams and methodologies of design. First, one of the future avenues for research would be to

better define the relevant local activity systems that are at stake. Exploring farming systems as an activity system, as proposed by some recent research works (Coquil et al., 2017; Vänninen et al., 2015), may be a possible way of achieving this. Second, seeing co-design process as a dialogical activity in which the results of designers' work fertilize the work of the users and vice versa (Beguin, 2013) appears promising. This dialogical activity would make it possible to interconnect different arenas in which farming system transformation is at stake: the first arena is the farm itself, where farmers redesign their own activity. Coquil et al. refer to the professional transformation of farmers professional worlds (Coquil et al., 2017). The second arena is farmers' peer groups, where new rules and arrangements for local changes in farming activities can be defined collectively from an agroecological perspective. The third arena is a group of stakeholders involved in the management of local farming and food systems, in which different agricultural sector stakeholders, including farmers and their advisers, can collectively define the local farming sector stakes and the problems to be tackled, share their views on the different activities and competences of each stakeholder, and coordinate actions to produce tools and resources to support changes into farming activity systems. Finally, we think it is advisable to see the co-design process as a way to help farmers to increase their autonomy in the search of their own solution, as developed by the Scandinavian school of co-design (Ehn, 2008; Gregory, 2003; Mumford, 1987). This means organizing the collective design processes locally and guiding them in the design of their own resources for change.

This questions what it means for a researcher to be a co-designer. What would a researcher's attitude be in a design set up in which the aim is to help people to achieve autonomy to solve their own problems in their own working situation? It calls on researchers to work on the problems that people face in real life, to let them lead their own projects and to help them search for their own solutions. Researchers could facilitate, participate, and monitor the collective process of inquiry to produce both scientific knowledge on the situation they accompany and to help formulate warranted assertions to guide the actions of farmers and other stakeholders (Martela, 2015) during the design processes.

Conclusion

This analysis, informed by the literature on design theory, has allowed us to identify five main approaches to participatory projects to design agroecological farming systems: De-novo design, Case-study design, Niche innovation design, Co-innovation, Activity centered design. When it comes to supporting the development of agroecology, we argue that an articulation is required between research oriented and support oriented approaches. Only under such condition, will the co-design process allow the transformation of farmers' practices, ways of reasoning and roles in local

knowledge production and innovation processes, which agroecology calls for. This implies sharing project leadership with farmers and organizing co-design locally to better bridge the gap between thinking and doing that will support the step by step re-design of farming systems in the long run. This means better accounting for both the singularities of farmers' situation and of the local activity system to transform. For local stakeholders, this means working together on a new organization of local extension systems to create - in collaboration with researchers - reflexive arenas that support farmers' changes on their farm. For researchers, it means putting themselves in the position of the participants and accompanying the co-design process.

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Chapitre 2

Les organisations de conseil doivent apprendre des interactions conseillers-utilisateurs pour accompagner la transition. Cas d'étude.

Photo 3: Travail collectif. Images des 8 journées d'animation dans les fermes avec trois groupes d'éleveurs voisins. Année 2016. Source Camille Lacombe.

Contexte et insertion dans la thèse

Initialement, mon implication au sein du projet SALSA devait m'amener à proposer une méthodologie d'accompagnement des changements dans les fermes, basée sur la confrontation des éleveurs aux résultats obtenus pour leur ferme via l'outil de diagnostic agroécologique co-conçu dans la première partie du projet. L'hypothèse que portaient les éleveurs impliqués dans le comité technique était que si l'analyse statistique des résultats du diagnostic, déployé sur un échantillon représentatif des fermes de l'AVEM, permettait de démontrer que les systèmes les plus autonomes étaient aussi les plus efficaces économiquement et sur le plan environnemental, il serait alors facile de convaincre d'autres éleveurs de s'engager dans le projet pour réfléchir à des changements de pratique à mettre en œuvre sur leur ferme. En parallèle du travail bibliographique que j'ai réalisé lors de ma première année de thèse (Chapitre 1), j'ai donc entrepris d'aller à la rencontre des éleveurs de l'AVEM, afin de mieux connaître leur diversité, leurs attentes et leur projets de changement au-delà du petit groupe que je côtoyais régulièrement au sein du comité technique.

Les entretiens exploratoires que j'ai réalisés auprès d'une vingtaine d'éleveurs de l'AVEM m'ont permis de poser le constat que le projet de transformation des fermes porté au sein du projet SALSA (l'efficacité technico-économique comme moteur pour la quête d'autonomie et d'amélioration des performances environnementale des fermes) n'était pas un projet partagé au sein de l'AVEM. De plus, j'observais parmi les éleveurs rencontrés une grande diversité de situations et d'attentes vis-à-vis de la transition agroécologique sur leur ferme. Partageant ce constat au sein du comité technique lors d'une réunion à la fin de l'année 2015, les partenaires ont décidé de présenter l'outil et le projet aux éleveurs de l'AVEM. Nous avons proposé d'animer lors de ces ateliers un temps d'échanges entre éleveurs sur l'intérêt de l'outil tel qu'il avait été construit jusque-là et ses perspectives d'utilisation. Lors de ces ateliers, auxquels une trentaine d'éleveurs ont participé, un usage de l'outil non envisagé jusque-là a été révélé : celui d'un support pour l'animation de débats entre éleveurs autour de l'explicitation et de la comparaison de leurs stratégies et projets individuels de changement, ainsi que de leurs représentations de la transition agroécologique. Cela demandait cependant de faire évoluer l'activité des conseillers du projet depuis une posture de prescription de recommandations aux éleveurs à partir des résultats de l'outil, vers une posture d'animation d'une dynamique collective d'échanges.

Cette observation m'a permis de resserrer le questionnement de ma thèse sur la question de l'évolution de l'activité d'accompagnement des changements dans les fermes dans une perspective de transition agroécologique. Dans cette activité, l'outil devait devenir un support d'animation d'un débat entre éleveurs et une heuristique pour penser et piloter les changements, plutôt qu'un

support pour prescrire des bonnes pratiques. La proposition méthodologique que je devais faire au sein du projet SALSA devait donc pouvoir favoriser conjointement l'évolution de l'activité des éleveurs et celle des conseillers qui allaient mobiliser l'outil dans leur pratique une fois le projet terminé.

Sur le plan théorique, la notion de transformation conjointe des activités individuelles et collectives au sein des organisations renvoie explicitement au concept d'enquête dialogique médiée, développé par Lorino pour appréhender les processus de changement à l'échelle des organisations (Philippe Lorino, 2009, 2015). Sur le plan pratique, l'accompagnement d'un tel processus revenait à créer des espaces d'expérimentation de nouvelles façons de faire entre éleveurs et conseillers, ainsi qu'à organiser la réflexivité sur ces expérimentations au sein du projet SALSA, dans le but de continuer à faire évoluer l'outil selon les retours de ces expériences. L'opportunité s'est également présentée de suivre la façon dont ces expérimentations seraient remobilisées au sein de l'AVEM, puisque l'animatrice vétérinaire de l'association a proposé d'organiser une réflexion entre salariés et membres du conseil d'administration sur la construction d'un suivi agroécologique pour l'AVEM à la fin de l'année 2016, et que j'ai pu participer à ces rencontres.

L'article 2 présente l'analyse du dispositif d'expérimentation mis en place avec les éleveurs de l'AVEM volontaires pour travailler à l'évolution de leurs pratiques et co-animé par l'agronome de l'AVEM et moi-même. Pour elle, le projet SALSA était en effet un moyen de réfléchir à des outils et méthodes sur la base desquels pérenniser son poste au sein de l'association. Partant d'une proposition d'animation d'une dynamique collective par petits groupes d'éleveurs voisins, visant à aider les individus du groupe à construire leurs propres projets de changement, nous avons fait évoluer ma proposition au fil des opportunités, et des retours et attentes des éleveurs.

Dans cet article, nous proposons d'appréhender l'activité de conseil comme une activité collective conjointe entre conseillers et utilisateurs du conseil, et dont la transformation se construit directement dans l'expérimentation de nouvelles pratiques et coordination en situation. Nous montrons également que la transformation de l'activité de conseil, dans une perspective de transition agroécologique, nécessite une reconfiguration de la relation entre éleveurs et conseillers vers une relation d'accompagnement pas à pas et compréhensive.

Résumé de l'article 2

How can advisory organizations accompany the transition of productive organizations, when both face the same uncertain and fuzzy context of change? In this article, we build on a conceptual framework to comprehend the changes that are taking place in advisory activities as a process of direct dialogical inquiry between advisers and users in the advisory situations. By applying this framework to a case study of a farmers' and advisers' organization dealing with sustainable transition, we show that the transformation of advisory activities in a context of transition requires the adviser-user relationship to shift toward a comprehensive and step by step logic of accompaniment. This shift in stance requires advisers and users to create spaces and times to test new practices and coordination, in a constant back an fourth between experimenting their own activities and reflecting about the process together. For advisory organizations, this means envisaging direct experimentation of new forms of adviser-user coordination as important opportunities to transform their activities in a context of transition and to create the necessary conditions to capitalize on these experiments so as to learn new practices and orient future activities.

Article 2

Advisory organizations need to learn from users-advisers interactions to accompany transition

A case study of a farmers' and advisers' association dealing with sustainable agricultural transition.

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Introduction

Our societies are facing increasing challenges and crises that create a context of great uncertainty for organizations and their agents. Many voices are calling for the transformation of our social and economic models to adapt to this context. Researchers have analyzed the process and the potential for transition from various perspectives: energy transition (Gugerell & Zuidema, 2017), diet transition, demographic transition, city transition (Nevens et al., 2013) or agroecological transition (Blesh & Wolf, 2014). They have investigated the transformation from a predominantly productivist and consumerist model of our societies into a post productivist and more sustainable model (Lawhon & Murphy, 2012; Marsden, 2013). However, the process for such transformation is complex because it is undetermined and requires unlocking a vast number of situations at different levels of human activities and production chains (Geels & Schot, 2007; Vanloqueren & Baret, 2009). Such works provide insights into the mechanisms of transition a posteriori from a macro perspective (Farla et al., 2012; Smith et al., 2005). However, as proposed by Bremmer et al. (2014), adopting a micro perspective within the socio-economic organizations would help identify the mechanisms in the making behind the practitioner's activity that unlock and favor the transition.

In transition contexts, productive organizations are immersed in an uncertain and fuzzy situation in which they need to navigate unpredicted crises and changes originating from markets, politics or consumers (Smith et al., 2005). In this context, their need for advice and support may increase, whereas the advisory organizations themselves are similarly confronted with a changing context. Surprisingly, the transition context appears to be absent from studies of the evolution of advisory activities and organizations. The existing literature focuses mainly on changes in services and advisory activities as a need to match what they are offering and users' demands and experiences (Body et al., 2015; Chen & Popovich, 2003; Donetto et al., 2015; Kranzbühler et al., 2018; Rosenberg & Hillborg, 2016; Yang & Sung, 2016). The uncertainty and fuzziness experienced by users, along with the long term perspective of transition are disregarded. For example, users may not be able to define a clear goal they wish to attain through change, and even if they are able to do so, the goals may become obsolete in the changing context. In the few studies in which the researchers propose and test methodologies to support the transition process, they tend to position themselves outside the existing advisory organizations (Bremmer et al., 2014; Carlsson-Kanyama et al., 2008; Loeber & Vermeulen, 2012). Consequently, they produce knowledge about the way to accompany transition, but do not explain how an existing advisory organization might deal with the process of changing its habits and practices to deal with and support the transition. The question remains entirely open:

how can advisory organizations actually accompany the transition process of productive organizations, when both are facing the same uncertain and fuzzy context of change?

The aim of this article is to inform this question by drawing on a theoretical proposal and its application to a case study in the specific context of the sustainable transition of agriculture. We apply an original strategy for research, in which we intervene, proposing a methodology to accompany transition to an existing farmers' advisory organization, and observed the way advisers and farmers adapted their practices and dealt with the sustainable transition of their farm. We believe the sustainable transition of agriculture is a good illustration of the problem faced by advisory organizations in a transition context. In fact, it has been shown that, for farmers, it corresponds to a long term and autonomous professional transition, in which they use a diverse range of instruments and knowledge to create new coherence for their activity in a search for sustainability (Coquil et al., 2017; Cristofari et al., 2018; Toffolini et al., 2017). Other researchers studied the process from the point of view of advisers, who find themselves in the position of accompanying individual farmers or farmers' peer groups during the transition of their farm (Cerf et al., 2011, 2010; Guillot et al., 2013). Here again, they point out that it corresponds to a profound change in their activity and in their representation of it (Duhamel et al., 2017). However, there are very few works on the way these 'changes in the making' call into question the organization of advisory services, and consequently how advisory organizations deal with them, which remain to be explored.

In the following section, we present the conceptual framework we developed to envision the changes in advisory activity from within advisory organizations. To do so, we focused mainly on the transformational process of advisory activities directly in the interactional situation between advisers and users. Focusing on this situation makes it possible to observe how they transform their activity through a dialogical inquiry process. We then present a farming advisory organization that wishes to accompany farmers during the sustainable transition and the research strategy we implemented in collaboration with them. After detailing our analysis for that case, we discuss our observations regarding the framework we propose, and assess its relevance to answer the question of how advisory organizations can accompany the transition process of productive organizations, when both are facing the same uncertain and fuzzy context of change.

Conceptual Framework

To comprehend changes in advisory activity in a context of transition, we propose a conceptual framework based on two main ideas: the idea that advisory activity emerges directly in user-adviser

interactional situations, and the idea that the transformation of advisory activity requires the setting up of a dialogical inquiry between users and advisers.

Here, we define advisory activity as an activity that emerges directly from interactional situations between users and advisers. Cerf & Falzon define advisory situations as situations of dialogue between the adviser, the user and their specific problematic situation (Cerf & Falzon, 2005b). As a consequence, it is not possible to consider advisory activity without considering user activity and its changing moves (Cerf & Falzon, 2005a). Taking this perspective implies considering the user as a participant in the changing advisory activities in the same way as the adviser. Users contribute their questions, ideas and problems to the situation and influence the adviser's responses to it through the roles they attribute to themselves and to the adviser in the process of solving their problems. Advisors influence both the way the problem is perceived and solved by the stance they take, the skills and experiences they have at their disposal, and the pre-structured frame of their intervention shaped by their own organization and the norms and rules they share with their peers (Mayen, 2005). Advisory activities emerge from interactions between advisers and users directly in the users' problematic situations.

In a context of transition, users might be facing uncertain and shifting situations in their activity that lead them to question and transform their way of working and the purpose of their activity. In such contexts, advisory activity may be transformed as a result of the transformational process of the user's activity and the emergence of new needs. Lorino (2009) proposes to comprehend the process of transformation of a joint activity as a process of dialogical inquiry between the different members who interact and depend on each other in the achievement of their own individual activity. As we argued above, we see the advisory activity as an interactional activity between users and advisers. We propose to consider it as a joint activity in which user and adviser interact. Consequently, we conceptualize the transformation of advisory activity as a process of dialogical inquiry that brings users and advisers together to transform, more or less consciously, advisory activity, and to preserve its continuity. The dialogical inquiry interlaces narrative thought, logical reasoning and experimental action to collectively make sense of and transform collective work situations (Lorino et al., 2011). It corresponds to an exploratory process to re-assess and re-design current forms of cooperation between people who interact in the normal course of their own activity (Lorino & Mourey, 2013).

Lorino draws on Dewey's work (Dewey, 1938) to define what he calls the dialogical process of inquiry (Figure 1). The inquiry starts from disruptive situations that render the usual collective activity unsatisfactory, if not impossible. In such situations, experience based beliefs and practices fail to produce the expected outcomes (Lorino & Mourey, 2013). Sharing this observation may lead

to a collective awareness that the continuity of the collective activity is threatened and the community of inquiry could formulate testable hypotheses that will be tested experimentally as a way to solve the formulated problem (Metcalfe, 2008). The process is recursive and requires establishing both a successful dialog between experimenting in the problematic situation and reflecting about the outcomes of these experimentation , and between individual experience and collective design of a coherent metanarrative for the new activity system (Lorino et al., 2011). Directly rooted in pragmatist philosophy (Dewey, 1938; Martela, 2015), the inquiry is a quest for meaning as a key to action rather a quest for truth as an accurate copy of reality (Lorino & Mourey, 2013).

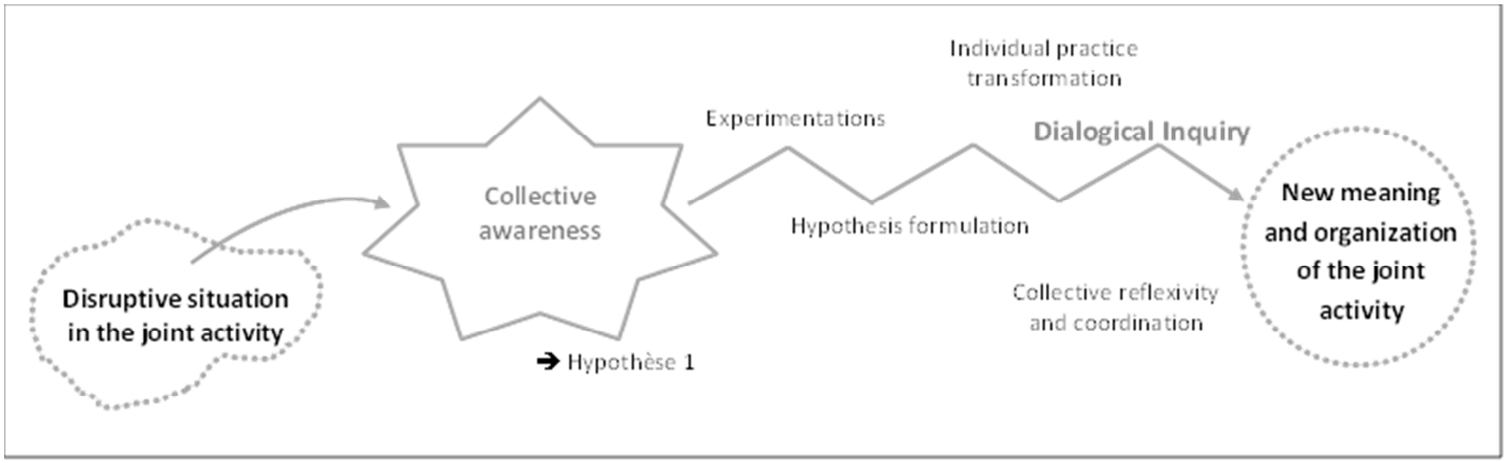

Figure 1: The different steps of the dialogical inquiry

The transformation of joint activity happens within two types of communities of inquiry: communities of practice and communities of process. A community of practice corresponds to a group of workers sharing a set of practices (Wenger, 2000). They are able to analyze, compare and exchange their experiences (Lorino, 2015). These exchanges may support the development of common rules, principles and norms that shape a certain way of doing their job (Clot, 2009). When several different types of professionals work next to one another without sharing the same practices, but purchasing common socially meaningful motives, Lorino argues for the need to set up communities of processes to insure a successful inquiry (Lorino, 2015). A community of processes corresponds to a community in which members share a joint activity, but due to division of labor and differences in their individual skills, they develop different working rules and practices (Lorino, 2015). For example, in the case of the restructuring of an electric power company in France, Lorino shows the impossibility of solving the problem faced by technicians, purchasers and accountants when dealing with the arrival of a new management information system, by separately applying their own professional routines and habits. In this case, what helped redesign the activity system was setting up communities of processes that brought together technicians, purchasers and accountants, so they

could regularly discuss and deal with the problems and malfunctioning of their new activity and the distribution of the tasks using the new software. In the case of the transformation of advisory activity in a context of transition of user activities, we suggest the relevant community of inquiry should include users and advisers in the definition of new rules and cooperation for solving users' problematic situations.

Case study

The farmers and veterinaries association (AVEM)

The case we present here is a farmers' and veterinarians' association located in the South of France. The association provides 160 farmers with a common herd monitoring service assured by three salaried veterinaries. They are mainly dairy sheep breeders who produce milk for the Roquefort cheese industry or other local milk selling and transformation channels. The main activity of the association is preventive health monitoring of ewe herds by veterinaries, but other activities (Figure 2). The association also takes part in research-development projects, in which the veterinarians and some of the farmers become involved because they are interested in the topic. In 2012, an agronomist was hired as project manager to implement particular projects on crop and pasture sustainability issues in response to the growing demand by members of the association. The project manager facilitates the projects that usually involve a group of between 10 to 30 farmers and deal with a specific question. For example, the agronomist sets up on farm trials and organizes training days to respond to the farmers' needs. In addition to the R&D projects, the association organizes collective training days on health and agronomic topics for its members. The sessions are planned each year in collaboration with the administrative board. Most take place once a year (management of pharmaceuticals, seed quality and sorting, etc.), but some are planned specifically to solve an urgent problem faced by the farmers or related to the topic of a R&D project. Half the training courses are given by the agronomist, half by the veterinarians. The administrative board is composed of 15 elected farmers. The veterinarians and the agronomist take part in the debates but do not vote on decisions. The veterinarian who founded the association 30 years ago chairs the general assembly and the administrative board meetings.

The SALSA project: accompanying farmers into sustainable transition

In 2013, five farmers on the administrative board agreed on the lack of advice to farmers concerning strategic global choices. In a context of market restructuring in favor of organic farming and the expansion and intensification of farms, they wanted analytical tools and advice to help them make appropriate choices on how to transform their activity. More specifically, they were concerned

by the fact that more and more farmers are choosing to increase the size of their herd, and to invest in bigger installations. Because the balance between the size of the herd and the capacity to produce sufficient fodder on farm can consequently be upset, some farmers are becoming increasingly dependent on purchasing fodder to feed their ewes. What is more, they were certain that this imbalance was synonymous with unsustainable farming systems, both in socio-economic and environmental terms. In response, with their advisers and the support of one the authors, they answered a call for projects published by the French Ministry of Agriculture. The SALSA project was chosen and the association received funding for a three year project management by the agronomist. The first action was to design a diagnostic tool to assess farm sustainability. Second, the tool had to be used on farms to support volunteer farmers in making long term strategic choices for changes to increase the sustainability of their farms. A technical committee was set up including representatives of different partner organizations (training, environment, research) to co-design the diagnostic tool and be responsible for monitoring the whole project.

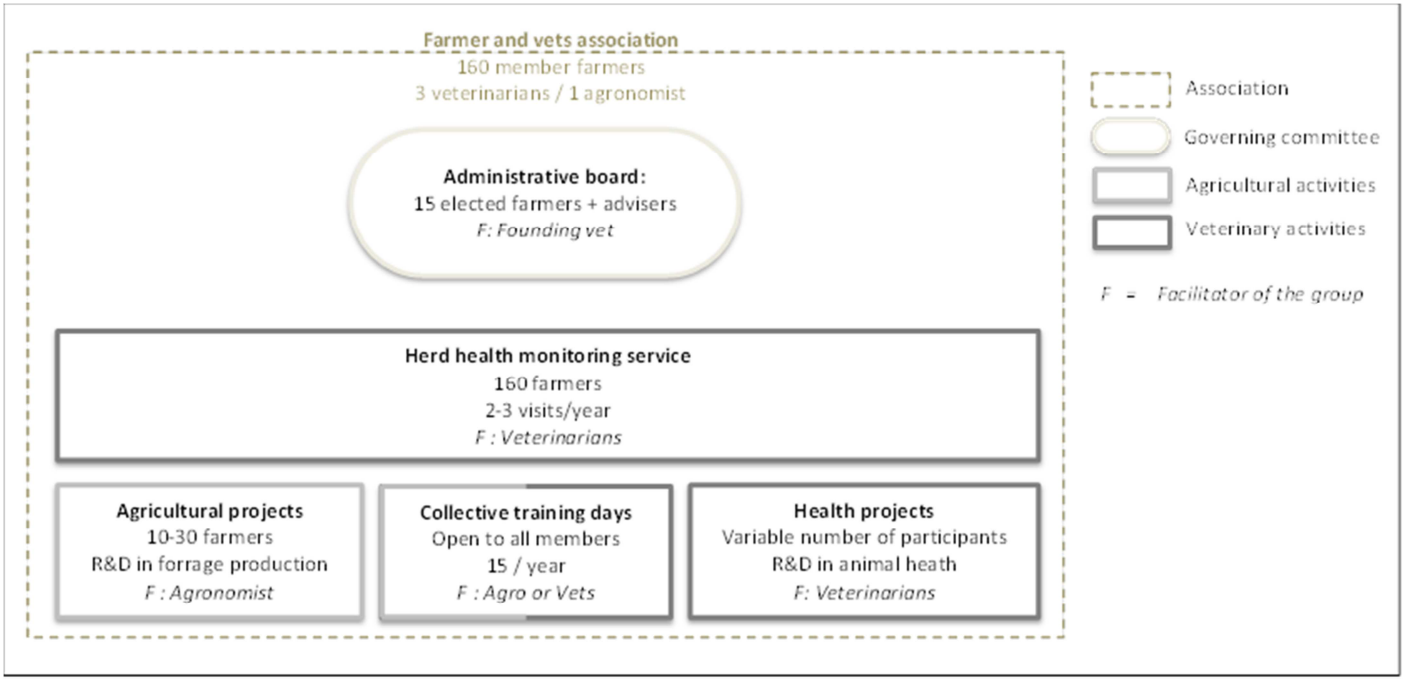

Figure 2: Organization and division of activities of the farmers and vets association

Research strategy and project implementation:

During the project, the authors of this paper were responsible for developing a methodology to support farmers in their strategic choices to improve sustainability. To this end, their intervention research methodology (David, 2000; Armand Hatchuel, 2000, 2001) promoted experimentation of new advisory situations between farmers and advisers in the association. First author involved with the association and suggested testing a long term facilitation process with local farmer peer groups, as a support for individual farmers' sustainable transition. As a start, she suggested collectively discussing and comparing the individual situations and problems of farmers who volunteered, using,

as a starting point, the results they had obtained with the farm diagnostic tool. She tested and facilitated these local group sessions in collaboration with the agronomist.

Three neighboring farmer peer groups emerged during the annual general assembly in March 2016. Between July and December 2016, the first author and the agronomist organized three collective sessions with two of the groups, and two with the third group. The groups and the content of the facilitation method evolved over the course of these sessions to adapt to the farmers' needs and questions. In addition to collective sessions to discuss the results of the individual farm diagnoses, they experimented collective farm's visits and global change simulation workshops at farm scale as methods to support individual farmers in making changes. The agronomist designed the methodology for the global change simulation workshop and chaired the sessions with us and the veterinarians. In collaboration with the veterinarians, she designed a tool to simulate the farm soil-herd equilibrium to provide answers to farmers' questions concerning farm scale changes. For example, one of the farmers with whom they worked with in the local peer groups sessions wanted to discuss the impact changing his dairy period would have on his farm with his neighbors and the advisers. During the change simulation workshop, the farmer was able to simulate and discuss with the group changes in his farm-soil equilibrium that could be caused by changing his dairy period.

During the time of these sessions, the founding veterinarian organized a discussion among members of the administrative board on the new service for the accompaniment of sustainable transition they would offer member farmers in the future. She organized three meetings on the topic. The first author was involved in their organization and implementation but took part as an observer rather than as an active participant. For the researchers, this was a way to observe what advisers and farmers retained from the discussions and the experience they gained in the SALSA project. All the collective sessions and meetings in which the researchers took part were recorded or filmed, and the first author kept notes of her observations and exchanges during the entire period of her participation in the association's activities (Figure 3).

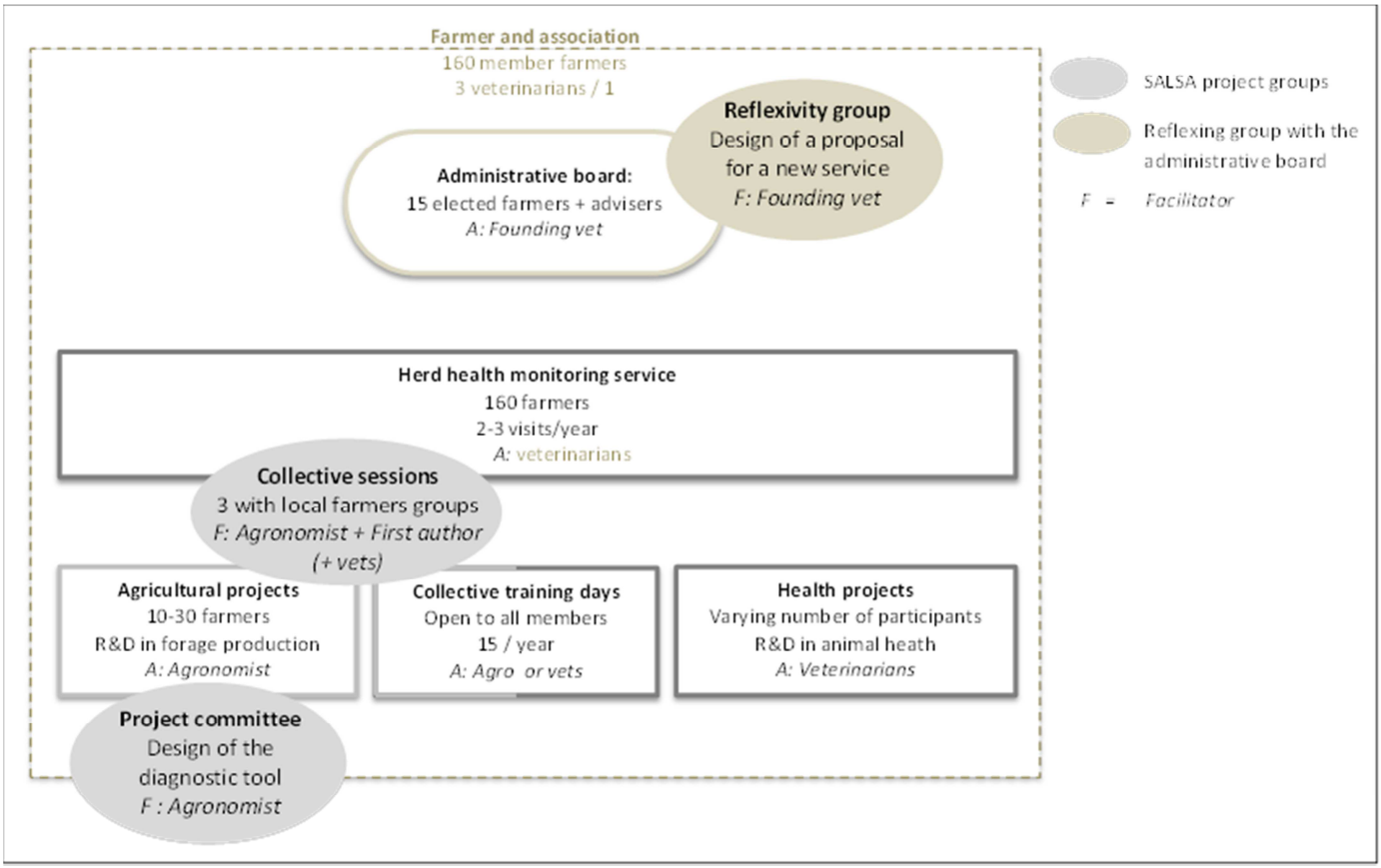

Figure 3: Work conducted by the different groups that emerged in the association during the SALSA project

Case analysis

The nature of interactions between farmers and advisers transformed during the SALSA project

During the SALSA project collective sessions organized to test new advisory situations with farmers' peer groups, the advisers transformed the way they interacted both with each other and with the farmers. In practice, the agronomist did not work on farmers' individual questions and cases, as most of her activity consisted in facilitating research and development projects and organizing collective day training sessions for members of the association. While designing the facilitation methodology for the collective sessions together, the first author and the agronomist agreed that supporting the farmers in agroecological transition should combine facilitation of collective exchanges between farmers and supporting individual farmers in making strategic choices concerning the changes to be made on their farms. Taking such decisions put them in the situation of experimenting the facilitation of collective meetings with the farmers, where the aim was to help a farmer formulate a plan for change, to discuss it collectively with other farmers and to use a diverse range of tools, knowledge and competences to help him/her take decisions. It led to questioning the usual relationship between farmers and the veterinarians developed for the health monitoring. service.

First, the farmers who took part in the sessions became co-designers of the advice and support given to their colleagues who were undertaking changes. For example, farmer GB, who took advantage of the collective session to exchange ideas with other farmers on his and his wife's (MB) project for change, said it was clear that one farmer he met had helped him to reach an important decision concerning changes on their farm. In an interview with researchers a year after the end of the SALSA project, the farmer and his wife said they had started a major reduction of the size of their herd. They explained that the farm visit in which GB took part during the SALSA project had been a decisive moment:

> *"(The farmer's wife)MB: That surely planted a seed in your mind. (The farmer) GB: Yes… […] I thought "why shouldn't we also succeed?" I don't know, but in managing the farm like he does. I mean not buying external feed, no dehydrated alfalfa… Yes, his approach was interesting. [….] he was almost completely self-sufficient. And you could see he manages his farm properly […]. That is very important! Personally, seeing tractors, facilities, doesn't particularly interest me. What matters to me is what is left to the farmer, how he works, if he is happy … Can you see he is happy or can you see he is under stress because he has a big loan to repay so he has to produce milk, but it's not really his choice? In his case, it was reassuring. When I talked with him, I thought that we could farm that way. GB, Personal interview, 19 October 2017, (translated from the French by the first author).*

Farmers also became co-designers of the facilitation process. In fact, at the end of one session, the facilitators asked the farmers what they wanted to do in the next session. In all three groups, the first step in any collective session was the same. One farmer, who had volunteered to discuss his plans for change with his neighbors, hosted the first meeting on his farm. On the day, he/she presented the history of the farm and his/her current projects and questions. The facilitators then presented the results of the diagnosis made on his and neighboring farms to compare and discuss the strategies, situations and problems of the individual farms. The day closed with a discussion of what the farmers wanted to explore with the group in future sessions. Farmers in group one decided to continue to study and support changes on the farm that hosted the first day, because the two host farmers (FO and MO) had a major project for change coming up and they were not sure what impact it would have on their activity (economic gain or loss, work organization, changes in the herd, forage, crops and pasture management, etc.). In this group, the second day was a group visit to a farm that had already undertaken the same types of changes, and the third day was a workshop in which the changes FO and MO wanted to implement were simulated, to predict and discuss the expected impacts on the different aspects about which they had concerns. Group 2 followed a different pathway: after day 1, which included a discussion about the case of LF, who was hosting the session, made the group realize they all depended to a greater or lesser extent on purchasing feed for their herd. They thus decided to work on this problem together. Farm visits were organized both to a farm that did not belong to the group, where the farmer managed to produce milk without purchasing

feed, and to farms in the group, so farmers could discuss individual problems and strategies more specifically. During one of these visits, one farmer suggested running a simulation of change on his farm, because he was starting a process of conversion to organic farming and was worried it would oblige him to purchase more feed. So a collective simulation workshop was organized on his farm.

Finally, the collective sessions created a new space for collaboration between the different advisers of the association and the farmers. The agronomist suggested running the collective simulation workshops in collaboration with the veterinarians, so as to incorporate their expertise and the herd management simulation tools in the process. Together, they designed a common simulation methodology to estimate the farm soil-herd equilibrium. The input data for the simulation were collected directly from the farmers during the workshop, and the agronomist and the veterinarians pooled the results to simulate changes in the whole farm management. This way of organizing the simulation process gave the farmers the opportunity to explore several options for change, not only the one the advisers considered to be optimal. This was the first time the agronomist and a veterinarian intervened together at the same time on a farm.

This transformation came to question the organization between advisers and the purpose of monitoring activities

The whole process of experimenting new advisory situations questioned the organization among the advisers of the association and, ultimately, the purpose of the monitoring by the veterinarians in a context of farm transformation. Accompanying farmers in strategic choices of change required considering the whole farm and all its different dimensions not only crop and forage management or animal health management, as separate elements of a farmer's activity. For example, FO and MO, who wanted to change their dairy period, had many different incentives and questions: increasing their income, better distribution of work throughout the year, herd autonomy improvement, better use of rangeland pasture resources, etc. Supporting them in these kinds of changes required considering all farm activities, and required long term support. This led advisers to work together on the same cases during the simulation workshops and to design a common methodology for action in such situations. At the end of the project, the advisors told us they had agreed on a weekly meeting with all the advisers of the association, as well as a common database gathering all available information on the work done on each farm, to facilitate sharing the information and to together track what was happening on the different farms.

Likewise, the norms used by the veterinarians to advise farmers on herd management during the collective simulation workshops were called into question. For example, during a simulation on his farm, a farmer (NA) questioned the first simulation of change designed by the veterinarian

concerning feed for his herd. NA wanted to simulate the changes conversion to organic farming would involve, and the veterinarian ran a first simulation using the same proportion of purchased feed for the herd as NA's current conventional practices. In the veterinarian's opinion, his current herd feeding practices were a good balance between quantity and quality, and insured the physical condition and health of the ewes to remain satisfactory for milk production. After the first simulation, NA asked to test another combination with less purchased feed to make him more self-sufficient and reduce his feed costs. After the workshop, NA was relieved to see that converting to organic farming would not make him less autonomous, because he could produce forage of sufficient quantity and quality on his farm. He planned to test rations that relied less on purchased feed in the coming years, even if there was a risk it would slightly reduce the productivity of his herd. In his opinion, purchasing less feed was more sustainable in the long run, and more logical in light of his choice to convert to organic farming, even if it could result in less regular physical condition of his ewes. This topic was discussed several times during the reflexivity group meetings with the administrative board. The fact that when farmers make an important choice connected with change, they need to reach their own compromises was recognized. The idea that an expert could confirm individual choices in such complex situations was rejected. In their point of view, it was the job of the whole group (farmers and advisers), as proposed by one vet.

A vet – During one of the administrative board meetings – 6th December 2016

"It's important to emphasize that this whole thing is collective. It's not the role of an expert who should approve our choices, it's the members of the group ".

Finally, the purpose of monitoring was questioned and a discussion began about the creation of a new activity within the association to continue to facilitate local farmer groups. The discussion between two veterinarians and the agronomist during the third meeting of the reflexivity group illustrates this particular question.

Exchange between two vets (Z & O) and the agronomist (E) during one of the administrative board meeting – 6th December 2016

« Z : But isn't it the facilitator's job to demonstrate that by starting with highly technical questions, it's possible to question the overall system, at the scale of the farm?
O: You have to be capable of functioning at both scales; otherwise you're going to lose people!
Z : We have to agree to act at the two scales, otherwise we're no different than other advisory services
O : Yes, it's clear we have to go beyond technical field visits
E : Yes, but it also means looking beyond day training sessions. Facilitating meetings with small groups needs to be a continuing process."

In the end, the administrative board decided to propose to the members that a small proportion of the annual membership fee to be used to finance part of the facilitation activity by the agronomist on a permanent basis. This proposal was approved at the general assembly in May 2017.

A problem of coordination between participant farmers and advisers made it difficult to organize the collective reflexivity

By simultaneously participating in and observing the whole process, we were in a position to identify some of the difficulties involved in organizing a successful dialog between the two different groups created during the SALSA project: 1/ the reflexivity group emerged in the middle of the project to get closer to the legal decision group of the association; 2/ it was difficult to organize capitalization, as people in the collective session groups were not all always present at the 'reflexivity days' to share their experience with the administrative board; 3/ it was difficult for the veterinarians to perceive the experiential groups and their members as holders of experiential knowledge that it is important for the organization to exploit.

We can say that the reflexivity group emerged in the middle of the project. In fact, at the beginning of the project, decisions and discussion about the design of methods and tools to accompany farmers making changes were discussed within the project committee of the SALSA project. However, we rapidly became aware that even if the organization was the holder and leader of the project, thinking about what should be tested during the project could and should not be limited to the SALSA technical committee for two reasons: first, the founding vet only partially participated in the technical committee and thus only had a partial view of what was being discussed and organized by the committee. Second, the farmers and advisers who belonged to the technical committee did not feel they could legitimately to put anything about the organization beyond the mandate of the administrative board up for discussion. For these reasons, the reflexivity group that started with several partners at the beginning of the SALSA project changed when we started to test the collective sessions with farmers and advisers, and got closer to the legal decision group of the association.

Another difficulty was that people in the reflexivity group were not all the same people who participated in the farmers' collective sessions. In fact, the only people who took part in the entire process were the agronomist and the first author. In addition, it was not easy for farmers and advisers to explain to members of the administrative board what had been done in the collective sessions. On several occasions, farmers who testified said how difficult it was to tell the "collective story" to the others, without sticking to their own questions and the experience they acquired on their own farm.

Finally, it was difficult for the advisers to perceive the experiential group and its participants as holders of experiential knowledge that was important for the organization to exploit. In fact, on several occasions during preparation of group reflexivity meetings with the administrative board, the founding veterinarian explained that it was very important not to focus only on the SALSA project. In her opinion, it was necessary to get help from outside experts on how to accompany the agroecological transition of the farms to feed the thought process of the administrative board. In her opinion, conducting an experiment with some members of the association with this explicit objective did not seem to have the same relevance. This created an additional difficulty, i.e. how to organize the exploitation of the experiments conducted during the collective session of the SALSA project.

Discussion

User specific situations when facing transition are both 'moments of learning' for their peers in similar contexts and opportunities to co-design new advisory services

Transition contexts put producers into situations of making choices of change to adapt both to shifts in their socio-economic environment and to their own wish to change their activity. In the case of agricultural transition, some recent works showed that farmers transform their activity through a process of dialog with their practices, in which they take advantage of external events and various instruments to which they choose to give more importance than to others, because they make sense in their search for a new coherence (Brédart & Stassart, 2017; Coquil et al., 2017). In our case, these situations of complex farmers' choice making offered very rich opportunities for new interactions, both with other peer farmers and with their different advisers. The case we present here clearly revealed the interest of considering such moments of interactions as moments when both advisory activities and farming activities are 'in the making' and adapt to each other. In fact, working collectively with farmers and advisers on one individual farmer's case helped him in his choice making process, and was a source of inspiration for the other farmers for their own farms. Likewise, it was a 'moment of design' of new advisory practices and coordination for the different advisers of the association. This finding clearly supports the idea of advisory activity as an interactional activity between user and advisers that emerges directly from advisory situations (Falzon & Cerf, 2005b). It calls for both testing new advisory methodologies based on collective facilitation of users' peer groups to support individual choices of change, and building new advisory methodologies and coordination in the situation itself.

Dialogical inquiry between users and advisers triggered the experimentation of new practices and coordination, but lacks a more strategic level of reflexivity

In our framework, we suggest understanding the transformation of the advisory activities of an organization as a dialogical inquiry within a community of process that assembles users and advisers. Our case illustrates how farmers and advisers together became aware of a disruptive situation, that is, the lack of a systemic vision on the part of advisors when supporting farmer in making strategic choices. Based on this awareness, they formulated a first hypothesis of action to transform this situation which became the SALSA project. The transformation of the advisory activity then occurred within a dialog between testing new practices in the collective farmers' sessions, and discussing possible orientations of advisory methods and services in different groups, the SALSA project committee and the reflexivity group with the administrative board. This process transformed the farmers-advisers relationship. It allowed advisers to coordinate among them, to intervene together on farms and to experiment a new way of facilitating local farmers' peer groups. However, we saw that this transformation was hampered by the difficulty the different advisers and farmers who participated in the SALSA project had coordinating among themselves and in taking a step back, to enable the other members of the organization and the administrative board to capitalize on their own experience. This was compounded by the difficulty the governing group of the association had in recognizing that any experimentation from the inside of the association could be a source of inspiration to formalize a new service of accompaniment in the association.

This raises the question of the success of inquiry processes within advisory organizations: how can leaders of advisory organizations and advisers learn from experiments their colleagues conduct in the field with users who are facing new problems? In our opinion, this questions the composition of the community of inquiry required for a successful output. In our case, the inquiry was helped by the fact that the community of inquiry was open to new advisers and farmers to bring ideas or questions into the group, so new advisory situations or coordination between advisers could be tested along the way, in accordance to changing trends in the farmers' questioning. Conversely, it was hampered by the fact that the community who started the inquiry had no legitimate right to take decisions on behalf of the association, and also by the fact that the administrative board did not fully recognize the experimentation as a source of learning and innovation. This is even more surprising for an outsider, because the administrative board was only composed of farmers and advisers, so one would have thought it would be easier.

These findings highlight the fact that in the fuzzy and uncertain context of transition, the community of inquiry gathering advisers and users in the design of new advisory activity may itself be

a shifting community, thus requiring continuing adaptation to enable new participants to contribute their questions, experiences and skills.

It also raises issues about the governing of the inquiry process. Who decides when the inquiry stops and what is retained and exploited at the scale of the organization? A democratic ideal suggests that the users of the services are those who should decide. But this questions the governing structure of advisory organizations and calls for more integration of users in the decision orientation of the advisory organization with which they work. This means going beyond the current trend of pushing users to recount their experience with the service. It calls for the redesign of the user-adviser relationship to enable users to design in collaboration with advisers, ways to experiment new advisory services that support their' own change, and to evaluate the efficiency of experiments to capitalize on their experience and to orientate future changes in the advisory services.

The capacity of advisory organizations to create the conditions required for collective learning from user-adviser situations and experimentation: a lock in for transition at organization scale?

Finally, we believe this paper sheds some light on how advisory organizations could deal with transition contexts, and on specific lock in to favor transition at the scale of the organization. For advisory organizations, dealing with transition contexts and accompanying their users through them means being able to favor, secure and exploit the experiments conducted by their staff and the experience their staff gains with users when dealing with complex situations of choice to change. This means considering their advisory activity as an emerging activity to be co-designed with the users in the users' situations. This also requires both users and advisers to adopt an inquiry logic to design their own change, and to accept that advisers are not providing pre-designed solutions to their problems. Ultimately, it means that the decision-making-bodies of the organization consider the ongoing experimentation conducted by users and advisers as a source of learning and innovation for the organization, if they want the inquiry process to be successful.

Chapitre 3

Co-concevoir des outils pour accompagner localement la transition d'un collectif : un processus d'expérimentation chemin-faisant

Photo 4: Réflexions. Réunion des différents partenaires du projet SALSA lors d'un comité technique. Hiver 2016. Source Camille Lacombe

Contexte et insertion dans la thèse

Le chapitre 1 m'a permis de mettre en évidence qu'accompagner la transition agroécologique nécessite de développer des démarches de co-conception locales qui s'inscrivent directement dans les situations d'usage des artéfacts et des prototypes de systèmes co-conçus, via la conduite de démarches de conception « pas à pas », tenant compte des systèmes locaux d'activité à transformer et des situations singulières des agriculteurs sur leurs fermes.

Afin d'opérationnaliser cette proposition, je propose dans ce chapitre une relecture de l'intervention que j'ai conduite avec mes deux directeurs de thèse au sein de l'ensemble du projet SALSA. Celle-ci nous a permis de tester une démarche de conception « pas à pas », au sens où elle a été conduite localement, directement avec la communauté utilisatrice de l'outil qu'elle a permis de produire, et dans une itération entre co-conception et usage. Les utilisateurs ont ainsi pu se saisir de l'outil directement dans leur activité. En effet, cette intervention au sein du projet SALSA a été double. Dans un premier temps, nous avons accompagné le processus de co-conception en permettant à plusieurs reprises d'ouvrir le questionnement du collectif de travail sur l'usage prévu de l'outil et sa pertinence pour ses futurs utilisateurs. Cela a conduit le comité technique à organiser une première situation de test de l'outil et de mise en débat de sa pertinence lors d'ateliers ouverts fin 2015 auxquels j'ai participé (Com. IFSA, Annexe 4). Après une phase d'amélioration de l'outil au sein du comité technique, j'ai proposé un dispositif d'expérimentation de l'outil en situation d'accompagnement aux conseillers et éleveurs volontaires (Chapitre 2).

Dans ce chapitre, j'analyse les effets et l'intérêt d'un dispositif de co-conception organisé comme un dialogue entre conception et expérimentation (Beguin, 2013) pour appréhender et accompagner localement des situations de transition agroécologique complexes et indéterminées. Je montre que ce processus a permis d'adapter l'outil co-conçu à la diversité des situations et des attentes des éleveurs en train d'implémenter des changements sur leurs fermes, auxquels il était destiné. Je montre également qu'au cours de ce processus, l'outil est devenu un instrument de la transformation de l'activité des conseillers et des éleveurs, ainsi qu'une source d'apprentissage collectif pour les partenaires du projet SALSA.

Résumé de l'article 3

The different approaches to co-design in a context of a community transition remains partly normative and determinist. Efforts are mainly concentrated upstream of the design process, which contributes to normalizing the aim and means for design before its confrontation with real situations. This may contradict the nature of transition that is an undetermined and open-ended process. In this paper, we propose to operationalize a theoretical proposition that conceptualizes the design process as an ongoing dialogical process between thinking and experimenting, and to test it directly in the field with a local farm community currently undergoing an agroecological transition. We wished to test whether it helps tackle the complex, open-ended nature of transition, and to favor the ongoing adaptation of design outcomes to possible future changes in their use situation. We developed an intervention research methodology to accompany farmers and their advisers in the co-design and experimentation of a farm global diagnostic tool to support farmers in their decision of change. We show that adopting such strategy allowed adapting the tool to the variety of farmers' situations and expectations regarding transition. During this dialogical process of design of the tool by farmers and their advisers, it became an instrument of the transformation of their own individual activities and a source for collective learning.

Article 3

Co-designing tools to support transition: an ongoing experience

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Keywords: design, dialogical approach, farmers and advisers association, pragmatism, intervention research

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Introduction

In a transition context, people have to deal with problematic situations in which the end and the means to act may be unstable and uncertain. Co-design is seen by many researchers as a way to explore such transition situations at a local scale. Co-design makes it possible to explore the future with the local communities concerned by the transition (Baibarac & Petrescu, 2017; Braun, 2016; Gugerell & Zuidema, 2017; Hölscher et al., 2017; Mazzarella et al., 2017; Yu & Sangiorgi, 2018). These works highlight the fact that co-designing to support community transition leads to focusing more on organizational and socio-economic problems, and consequently to adopt a more constructivist approach to co-design (Avenier, 2010). Some researchers adopt a co-creation perspective for design. In this case, the aim of the co-design process is to achieve a shared understanding of the problems faced by the participating community and to collectively define prototypes of tools and resources they could use to solve their problems. These works rely on the use of probes and toolkits to help people express their problems and share their experiences (Fabri et al., 2016; Madden et al., 2014; Sanders & Stappers, 2014). Others adopt a more "design to design" perspective (Ehn, 2008), in which the main aim is to give people the capacity and resources to design what they need on their own. In a more technical and materialist vision of design as a process of production of an object, we cite the example of Fab-Labs (Stacey, 2014), which is a place where people encounter a wide range of tools and resources to build or repair the objects of their need. In a more social vision of design as a process of creation of innovative social set ups and coordination between people, the question is more to build people's capacity to interact with each other and exploit a variety of competences to develop new social organizations (Botha et al., 2017; Nevens et al., 2013; Seravalli, 2011).

However, all these approaches remain partly normative and determinist, as they concentrate their efforts on the upstream part of the design process itself. They both help define and normalize the aims and means for design before confronting it with real situations (Jalas et al., 2017). This approach surely contradicts the very essence of the undetermined and open-ended transition process. We noted that very few studies try to articulate the co-design process with experimenting the design object in its real use situations (Gugerell & Zuidema, 2017; Jalas et al., 2017). What is more, the papers remain conceptual and do not concretely demonstrate the advantage of linking the two sides of design. Whereas we assume that only under these conditions can the product of design be useful to communities by supporting their transition process, as it has been adapted to the changing and varied end they face.

In this paper, we consider the co-design process in a context of transition as an ongoing dialogical process between thinking and experimenting together. Relying on pragmatist logic, we tested this design hypothesis directly in the field to evaluate its capacity to perform in the context of transition of a local community. To this end, we developed an intervention research approach with a group of farmers willing to co-design a method to provide local support for the agroecological transition of their own farming systems. During the project, we organized different iterations between the spaces where the tool was thought out and produced, and a space where it was experimented. First we present our design hypothesis and the research strategy we build to test it as part of the SALSA project. After describing the different work stages of the project, we present the results of this social experiment and discuss the relevance of our theoretical and methodological concept of co-design to support the transition process of a local community. We conclude with recommendations for practitioners who work with communities in transition.

Design hypothesis

Pascal Beguin, a design ergonomist, suggests considering the design process as an unending dialogical process between users and designers, in which the outcomes of the design process orientate and feed the use situation and vice versa (Beguin 2013, see also Béguin et al. 2012). In this perspective, the design process corresponds to the joint development of the artefacts and of the activity of those who will use them. He suggests that the outcomes of the design process become what he calls instrumental hypotheses in which designers design an artefact while defining its potential use. The dialogue between design and real use situations by the end users makes it possible to develop the artefact iteratively and jointly into an instrument to develop both the activity of the users and that of the designer. Darse and Falzon proposed in the 1990s who described the co-design process as a process that gathers people working simultaneously and separately on the design of an object (Darses et al., 2000; Falzon & Darses, 1996).

Here, we apply both ideas together to co-design, which means integrating end users in the design process right from the beginning and taking their experiences of the use situation into account during design (Sanders et al., 2007). In this case, it is a question of organizing co-design as a distributed process over time and in space, with the end user taking part in the whole process, and not only a question of inviting the end user to join a completed and delimited design process. In this paper, we test the relevance of this theoretical proposal for co-design in the specific case of community transition. In this case, the co-designers are members of the community who volunteered to design resources and set ups to support their own transition, and other members of the community, who will not necessarily take part in the collective thinking phase of design, but may

use and test its outcomes. Our hypothesis is that such an understanding of the co-design process will help tackle the complex, open-ended and undetermined nature of transition, and favor the ongoing adaptation of design outcomes to possible changes in their use situation.

Intervention in the SALSA project

Research strategy

We adopted a pragmatist strategy to test this hypothesis, which means we tested our hypothesis directly in the real world to see whether or not it produced the effects we expect. Pragmatist philosophers (Dewey, 1925, 1938; Peirce, 1934) rely on a consequentialist framework to validate an assertion.

> *« Hence is justified the maxim, belief in which constitutes pragmatism; namely, in order to ascertain the meaning of an intellectual conception one should consider what practical consequences might conceivably result by necessity from the truth of that conception; and the sum of these consequences will constitute the entire meaning of the conception. »*
> *Charles S. Peirce (1934)*

Pragmatists suggest that the only way for someone to build and stabilize a doubtful belief is to experience it and observe the outcome of the experience (Dewey, 1925).

In our case, we aimed to tackle the complex, open-ended and undetermined nature of transition, to encourage the ongoing adaptation of the design outcomes to possible changes in their use situation, and we use the design framework of Beguin to achieve these objectives (Beguin 2013). To this end, we developed an intervention-research framework (David, 2000; Hatchuel, 2000; Perez, 2008) with a local farmers' association willing to facilitate their own agroecological transition. With them, we obtained three years of funding from the French Ministry of Agriculture to locally design a methodology to accompany farmers in their agroecological transition. In the project, we (the authors) were responsible for accompanying the collective design process and for proposing facilitation methodologies. Throughout the project, we tried to insure there was a constant back and forth between collective thinking and the design of resources and set ups to support the transition, and testing them, with the farm community, in real use situations. We conducted our intervention as an iterative experiment (Ansell & Bartenberger, 2016) in the sense that we continuously and iteratively adapted our actions in the light of their impacts and of the experience we were acquiring with our partners in the project.

Presentation of the SALSA project

The farmer association we worked with mostly comprises dairy sheep farmers. The association is located in the south of the Aveyron region, which is part of the Roquefort cheese production area. In 2013-2014, they faced a quite large restructuration of the Roquefort sector, which resulted in considerable uncertainty concerning the future of dairy sheep farms, and reinforced farmer's fears about the stability of their income, already threatened by the recurrent drought episodes that have occurred in the area in the past ten years. In this situation, many farmers adopted an enlargement strategy, particularly by increasing the size of their herd, intensifying their production system and increasing their use of external inputs to secure large amount of milk production, and supposedly, their income.

Having observed the increasing discrepancy between herd size and soil production potential on their farms, a small group of sheep breeders and their advisers, (all members of an association called AVEM), decided to tackle the problem in order to support farmers in their path toward sustainability and agroecology. The AVEM association, which today has 160 members, mainly sheep breeders, and three veterinarians, was created 40 years ago to share a preventive herd health care monitoring service. All the members are entitled to two or three preventive visits by a veterinarian every year at key moments in the ewe production cycle to work on health issues and ewe nutrition, all with the aim of optimizing milk production. The association has always relied on collective action and a global vision of farms as a key to farm sustainability. In 2012, they hired an agronomist to work with volunteer farmers on forage autonomy and participatory selection and adaptation of forage seed. Before the project began, the farmers' and veterinarian's reasoning was that existing advice and support provided to farmers faced with making important choices concerning changes on their farm was fragmented, due to the extreme specialization of the advisory services. As a result, farmers lacked a global and long term view of the possible impacts of change. To solve this problem, they suggested co-designing a global analytical tool at local and farm scale to diagnose the situation of each farm and to identify 'virtuous situations' in terms of farm-soil equilibrium and environmental impacts, along with levers for change. They wanted to use the tool to support farmers' choices concerning possible changes and the best way to tackle the agroecological transition. To implement their project, they got together with local partners in the territory and formed a technical committee (the designer group), in charge of the design and testing of the tool during the three year project funded by the French Ministry of Agriculture. The members of the designer group were five sheep breeders who belonged to the AVEM association and who were at the origin of the project, plus two veterinarians and the association agronomist, one technical and economic adviser from another farmer organization in the area (CETA "de l'herbe au lait"), three members of staff from the Natural

Regional Park (*Parc Naturel Régional des Grandes Causses*), two representatives of the local agricultural high school (La Cazotte) and its experimental farm, and the three authors of this paper. The agronomist was in charge of managing the project.

Chronicle of the SALSA project

The SALSA project started in February 2014 and ended in February 2017. During this three year period, the technical committee of the project met 15 times, usually in the office of the AVEM association. Twelve sessions and workshops were organized for the farmers of the community (AVEM members), who were the main targeted beneficiaries of the project. A public meeting was held on February 1, 2017, to present the outcomes and future of the project. Next we detail the different phases of the project (Figure 1).

Phase 1: First, building the tool collectively in the designer group

The first phase of the project consisted in designing the farm analytical tool in the designer group and in testing it on the farms along with surveys to collect farm data (Figure 2). The work was distributed among partners based on their competences with respect to the criteria the farmers had identified as being appropriate to evaluate the farms' agroecological performances: farm autonomy and output efficiency, and the impact of farming practices on the environment. The CETA adviser was responsible for the design of a technical and economic module of farm autonomy and efficiency. The project manager led the design of the module for the evaluation of the impacts of farming practices on the environment, in collaboration with the officers from the regional park and other partners. The first versions of these two modules were tested separately with volunteer farmers (in the case of the autonomy module, mainly with farmers in the designer group, whereas 40 farms were visited to test the environmental module). These inquiries were the first opportunity to test the different modules and discuss them with other farmers of the association. The criteria chosen by the designer group to evaluate the agroecological performances of farms were partly criticized by participants in the inquiries. For example, some did not consider feed autonomy to be an agroecological priority, others criticized the fact that the environmental evaluation favored organic practices, whereas organic farmers may be those who purchase the most feed off farm to feed their herd, which may increase the environmental cost outside the area (which was not among the criteria taken into account in the environmental evaluation module). This led the technical designer group to review the weight given to criteria related to organic practices and to give more importance to energy consumed on the farm for farm production, which is an external input. All these debates raised the awareness of the designer group of the need to open the discussion about the tool and its use with other farmers in the association, and to start testing it in the use situation on farms.

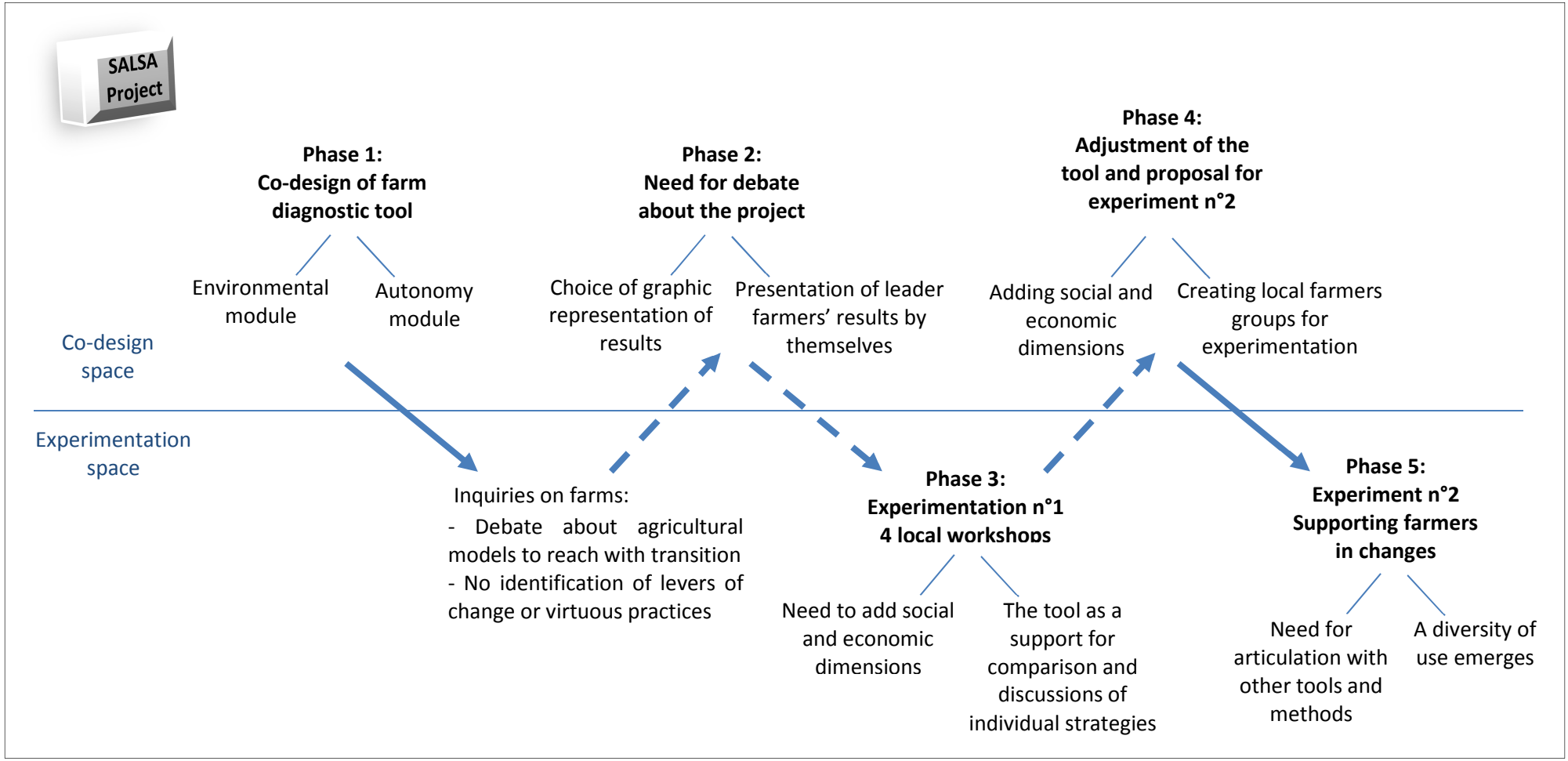

Figure 1 : Chronicle of the design and experimentation of the farm diagnostic tool during the SALSA project
The blue arrows represent the moves between the co-design and the experimental spaces during the project. Dashed arrows correspond to unforeseen moves.

Figure 2: Members of the designer group during a technical committee meeting to work on the farm analytical tool

Phase 2: The need to open the discussion about the tool provides the opportunity for the first experimentation

To better take the expectations and experiences of the farmers into account during the design of the farm analytical tool, the technical committee decided it was necessary to start testing it on concrete farm cases and to present and discuss the content of the tool. They decided to organize four local workshops in the different geographical areas where AVEM members are located. Farmers in the designer group suggested that, after presenting the project and the tool to the others, each one should present his own questioning concerning his farm and the results achieved using the tool. A third part of the workshop would be devoted to a collective discussion of the project, the tool and its potential interest for participants. While preparing the workshops, the farmers of the technical committee suggested representing the results obtained by one farm in the two different modules as a single point on the graph (see Figure 3). In their opinion, using this form of representation was very demonstrative because it made it possible to compare as many cases as desired on one graph, while simultaneously keeping a global overview of the situation of each farm. In addition, it would give a clear idea of the situation one wished to reach with the transition, i.e. the upper right quarter of the graph. Finally, it would be possible to see the different pathways taken by the farms on the same graph if their situations were monitored over time.

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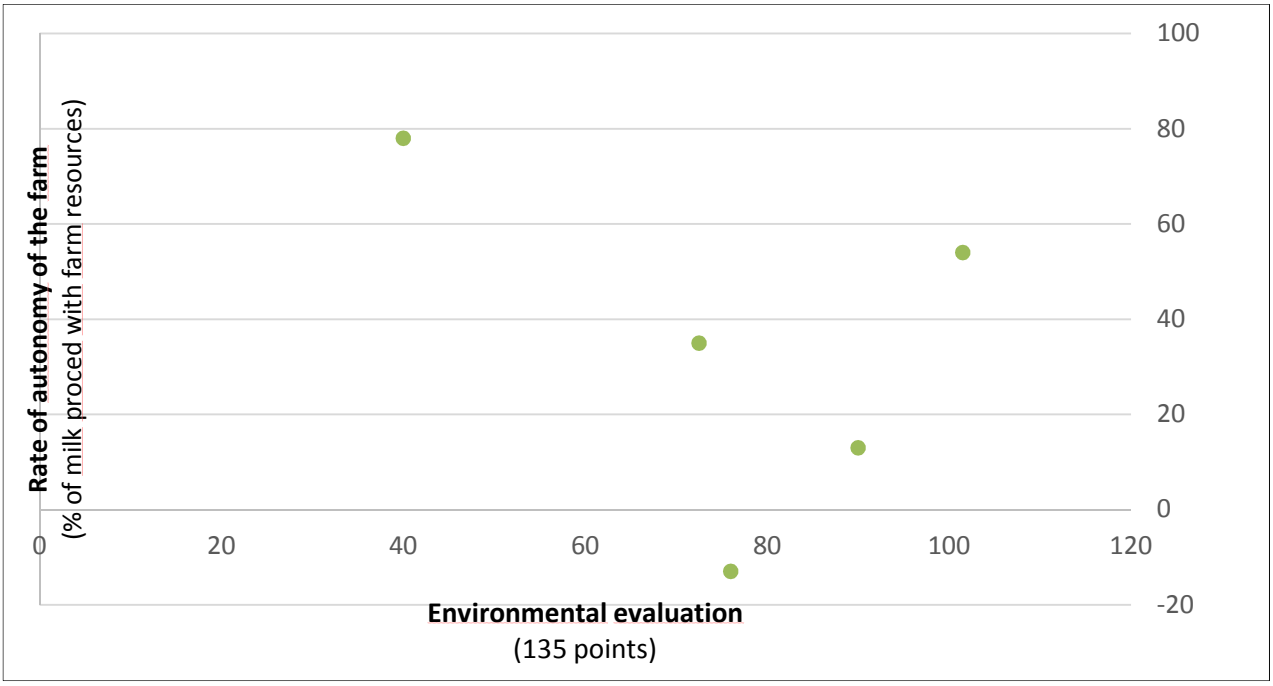

Figure 3 : Position of five farms with respect to the rate of autonomy of the farm and the impact of farming practices on the environment.

Phase 3: The first experiment to present the tool and its first results

Four workshops were organized in the different regions (Figure 4). Thirty farmer members of the AVEM association attended them. During these workshops, the situations of ten farms where the two modules of the tool had been tested were presented. The majority of farms concerned were those belonging to farmers in the designer group. In each workshop, one of these farmers spontaneously presented the situation on his farm and his results. In so doing, they explained their current position to the others and discussed their projects for change. The workshops confirmed the interest of using the graph to present the results to farmers during group meetings. However, it led the designer group to consider adding new dimensions to the tool they had not previously considered: participants requested that specific criteria that provided information on the farms' economic and social situations be added to the graph. In fact, they insisted that having an overview of a farm's situation would be useless without this information. "Being self-sufficient and in a virtuous situation for the environment is not enough if my farm does not allow me to live properly and if I work myself to death…" as one farmer put it. They also considered using the tool differently from how they had imagined using it at the beginning of the project. During the course of the project, presenting and comparing the situations of the farms using the evaluation tool turned out to be a way of facilitating the explanations and of favoring the discussion of farmers' individual strategies and projects for change in the neighborhood groups.

Figure 4 : One of the collective workshops organized to present and discuss the tool with the farmers.

Phase 4: Adjustment of the tool and suggestion for a second experiment

Following the demand expressed during the workshops, the designer group worked on adding new economic and social aspects to the global analytical tool. For the economic aspect, the farmers in the designer group suggested including the gross operating profit of the farm, and if the farmer agreed, his income. For the social aspects, they agreed that it was necessary to add a qualitative evaluation of how the farmer feels in his work (using smileys) and an approximation of how many days off he has per month (including weekends and holidays, as a mean for the entire year). Other economic and social information was requested during the survey (the debt ratio, farm succession, etc.). The general analysis including calculating self-sufficiency, evaluation of the environmental impact of farming practices and the social and economic diagnosis was carried out entirely by thirty volunteer farmers who were interested in knowing their results and discussing them in the neighborhood groups. At the same time, considering the possible new use of the tool revealed during the workshops, the researchers proposed a method of facilitation to be used in local group sessions with farmers who volunteered to work on their cases and receive support in their choices of how to move toward more agroecological practices. Following the wish expressed by the farmers during the workshops, the researchers suggested that the small neighbor groups should start with a cycle of three group sessions they would animate in collaboration with the project manager. The first session was envisioned as a diagnosis of the local area. One volunteer host farmer would present the history of his farm, his situation and his own questioning and projects to the others. His situation would then be compared with the situations of the other participants using the co-designed analytical tool, so the farmers could compare and discuss their strategies, problems and questions. The workshop would end with a discussion about how to continue working together, and what topics or questions they would like to work on in the following session. The second day was planned to be a farm visit,

where those interested could see and discuss the topics covered and the questions asked in session 1. Session 3 would be either another farm visit, or a workshop with simulation of change on one farm, or another session similar to the first session with another farmer in the group being the host (Figure 5).

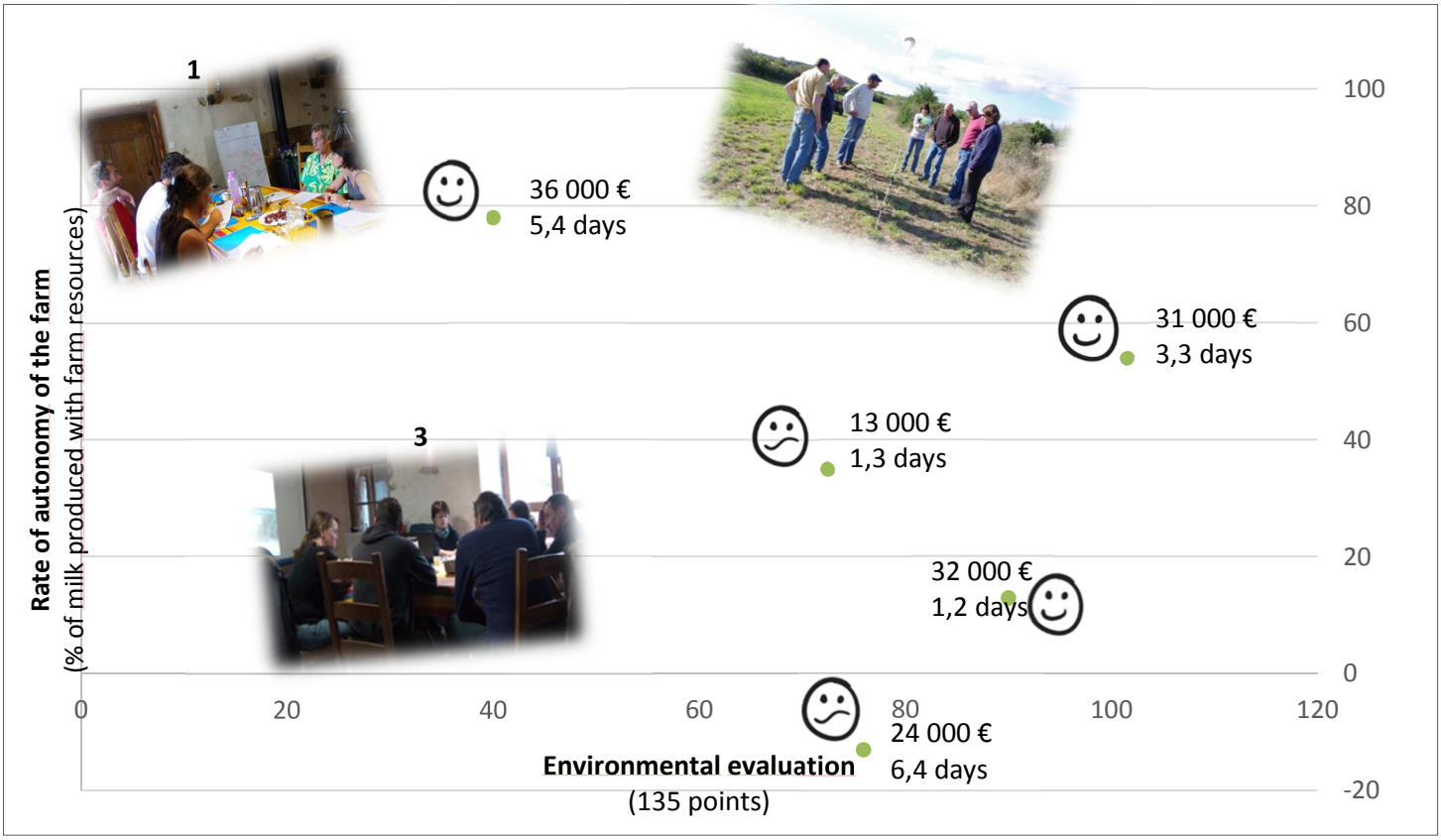

Figure 5: Presentation of the current situation on the five farms by the analytical tool once social and economic dimensions had been added. Pictures 1, 2 and 3 represent the configuration of the different types of sessions that were proposed to volunteer neighborhood groups (respectively: Session 1, Session based on a visit to a farm, Session with a simulation of change).

Phase 5: A second collective experiment to support farmers in their choices for change

Three neighborhood groups joined the process, animated jointly by a researcher and the agronomist project manager. The groups contained respectively 4, 7 and 8 farmers from three different areas and evolved with different dynamics. Each group started their first session in the same way: one farmer presented his situation to the others, his situation and projects were then compared with those of the other participants, this was followed by a group discussion about the most important work to do in the following sessions. Group one decided to focus on and follow the changes the host farmer wanted to implement on his farm in the coming year: advancing the dairy period to start milking two months earlier to increase his income, the self-sufficiency of the farm, and to better match the ewe production cycle with forage production on the farm. Session two was a visit

to a farm that had already implemented such changes, and session three was a workshop with a simulation of change on the farm. To simulate changes in every aspect of the farm activity, the simulation of change with the analytical tool was completed by the simulation of change in the technical aspects of the work: changes in crop distribution and management, and changes in herd management and feeding. To complete the expertise of the farmer group, and of the two facilitators (the agronomist and the researcher), one veterinarian who belonged to the association participated in the simulation workshop (Figure 6). Group two concluded from session 1 that their farms lacked autonomy due to their difficulty in improving pasture management and forage production. The group continued with two farm visit sessions to work on this topic. During one of these visits, one farmer asked to the group to help him adjust his farm-soil balance with the conversion to organic farming he was implementing. One simulation workshop with the veterinarian was also held on his farm during the course of the project and the group continued to function after the end of the SALSA project, with facilitation by the agronomist project manager. Group three followed a similar path to that of group two and also continued to function after the project ended. However some farmers who had not carried out the diagnosis asked to be able to do so and to host group sessions on their farm after the project ended. Another asked to do the diagnosis again after an interval of two years, to be able to see the results of the changes he was making today.

Figure 6: Session 1 and 2 with Group 1

Results and discussion of the design experiment

Experimenting the tool during co-design allowed farmers to debate about the end of change to transform its content and use philosophy

In the chronicle of the SALSA project, we identified three different moments of experimentation of the diagnostic tool with other farmers than those in the designer group (Phase 1, 3 and 5). All were moments of debate between the farmers of the association about the end of the agroecological transition.

First, the survey conducted on farms enabled the project facilitator to report back to the farmers in the designer group how the interviewees had perceived the tool and, more specifically, the criteria they suggested were needed to evaluate the agroecological performance of a farm: organic farming practices and self-sufficiency. It led the project facilitator to hold specific workshops with the farmers in the designer group to rediscuss the criteria they considered relevant. At this stage, they did not want to make any major changes to the two modules but they suggested the designer group should change the weighting of the different criteria and dimensions, so that organic farming would not be an end in itself, but would be balanced against the efficiency of external outputs purchased for farm production and against herd feed autonomy. This first debate made us aware of the need to organize a broader debate with farmers of the association and to start experimenting the tool designed to support farmers' transition processes.

Second, the four local workshops used to present the tool and the first results to the farmers were important moments of debate among them about the objectives of the transition. In fact, the way the designer group had chosen to present the results of the diagnoses made on farms belonging to the farmers in the designer group as a function of the optimal situation farms could achieve with the transition (see the upper right of the graph in Figure 3). This optimal situation would correspond mainly to self-sufficient organic farms. This was the subject of debate among the farmers because some farmers clearly thought they were on the right track to achieving agroecology by implementing different strategies and did not interpret agroecology in the same way. For example, some farmers considered it very important that they processed their milk on farm or used small local dairies, which, in addition to allowing them to sell their cheese on local markets and maintain a relationship with their customers based on confidence, in turn allowing them to support local jobs. For the farmers who spent time processing and selling milk, and cheese, the priority was not to technically optimize their crop and fodder management in order to become more self-sufficient in terms of feeding the herd. They placed more value on the socio-economic dimension when choosing their strategies for the transition. Moreover, some farmers were not convinced that being self-sufficient in terms of crop and forage production was always a good economic strategy for farmers, particularly for organic farmers. In fact, mechanical weeding can be time consuming and expensive in organic conditions, as well as soil preparation and sowing, and yields may be lower. So under certain conditions it might be better economically to buy part of the food out of the farm, weather than produce it by yourself.

Finally, these disagreements led the designer group to adapt the diagnostic tool to a broader view of the different possible transition pathways. They added two new dimensions to the diagnostic tool (social and economic dimensions), and unforeseen uses of the diagnostic tool were discovered:

in addition to using it to diagnose and compare the situations of individual farms, it was also tested as a tool to facilitate the expression of individual strategies and collective debate among farmers.

In the end, we can affirm that trying out the tool during co-design allowed the co-designers to transform both the tool and its use from what had been foreseen at the beginning of the project, to adapt it to the end users' needs and experiences. If we draw on Hatchuel and Weil's proposal on how to analyze management tools and their design processes, we can say that, along the way, three dimensions of the tool were transformed: its technical base, its management philosophy and its organizational structure (Hatchuel & Weil, 1995). The technical base of the tool corresponds to its informational and material dimension –« the data »- it gathers and puts in relation. It is often the best described dimension of a tool in the biotechnical analyses. The management philosophy corresponds to the logic of action of the tool designers to analyze and transform the activity they aim to support. Finally, the organizational structure corresponds to the part played by the different users and the distribution of theoretical and practical knowledge among them. In our case, these different dimensions of the farm analytical tool were transformed jointly thanks to trying it out during the co-design process. The four local workshops (Stage 3) are a good illustration of the process: farmers discussed the technical base of the tool and insisted on adding socio-economic aspects (Lacombe et al., 2016). Although it had not been foreseen by the co-designer group, the tool turned out to help farmers explain and compare their individual strategies and projects for change (Lacombe et al., 2016). Although at the beginning of the project, the tool was expected to be a prescriptive instrument that would be used by farmers and advisers to orientate farmers in their choices for change, it subsequently became a heuristic to compare, discuss, imagine, simulate and follow changes over time (Stage 5). In another paper, we show how this stage of experimentation was a source for the redesign of the farmer-adviser relationship in the AVEM association and a source of experimentation for a new type of coordination between advisers in supporting volunteer farmers in the agroecological transition (cf. Chapitre 2).

Experimenting the tool during co-design allowed to match its use with farmers' singular, complex and fuzzy situations of transition

At the beginning of the project, the diagnostic tool was expected to be a way to evaluate and compare the situation of farms with respect to the agroecological transition and to identify good practices and levers for change. While trying it out in a variety of use situations, the co-designers came to consider it more as an open and scalable resource in its use and content. As a result, it became more suited to the diversity of situations and questions faced by farmers and their advisers. This ongoing process of experimentation also favored collective learning and the training of the

different co-designing users, both about the practical uses of the tool and about farmers' specific and diverse situations of transition.

Firstly, while the project was advancing and iterations between use and design of the tool were multiplying, the different partners in the co-design recognized the interest of keeping it open and scalable. In fact, they realized it was a way of attracting broader participation by farmers in the project. After the four collective workshops, about thirty farmers were interested in joining the project and using the enriched diagnostic tool on their farm, whereas at the beginning of the project, only five farmers in the designer group participated to the project. At the end of the project, the project manager considered the ongoing process of adaptation of the tool as "a way of making the user farmers actors of the design of the tool" (quotation from the public report of the SALSA project, see www.avem12.org).

Secondly, testing the tool in different concrete situations of inquiry and discussion among farmers, or using it to support them in making different choices of change, made it possible to adapt it to the variety of farm situations and state of advancement of the transition. For example in Phase 5, the tool was used as a support to facilitate the presentation of individual farmer's strategies and projects for agroecology, and to facilitate the debates and comparison of these individual strategies. It was then used during two simulation workshops, when the farmers wanted to explore different options for changing their practices. The tool was both a simulator and a support for discussion of the different aspects evaluated by the participants. In return, they supported the host farmer in envisioning the changes he could expect in his entire activity, based on their own experience.

Thirdly, the ongoing experimentation also favored ongoing learning by the different co-designers, both about the practical uses of the tool and about the farmers' specific and diverse situations of transition. For example, at the end of the project, one of the officers of the Regional Park explained that the project had helped them to better understand the farmers' stakes in the agroecological transition and their way of reasoning about it.

> *« la construction de l'outil de diagnostic avec les éleveurs nous a permis de se placer au cœur de la ferme et du raisonnement des éleveurs. C'est un apprentissage important pour le Parc Régional qui a peu l'habitude d'avoir accès à cette façon de penser les choses. »*
> An officer of the Regional Park, 20/03/2017

A veterinarian explained that from his point of view, the technical committee learned about a different way to manage a project with farmers. For him, it was a rich experience to study the results

of the analytical tool directly with the farmers on their farms, as a resource that enabled discussion about possible changes.

> *"SALSA c'est un projet qui a permis de travailler différemment sur le relevé, la construction et la mobilisation des références et des données. […] L'AVEM est habituellement embarquée dans des projets pour faire remonter de la donnée sur les systèmes ovin-lait, mais les références qui sont construites à partir de ces données dorment ensuite dans les tiroirs. Il n'y a pas vraiment de retour et d'appropriation par les éleveurs."* A vet, 20/03/2017

On the day a meeting was held to inform the public about the results of the project, one of the farmers, responded to a spectator who questioned the scientific value of the results produced by the analytical tool:

> "for once we did something of direct use to farmers […] If it helps us think about the changes we make on our farms, isn't it enough?" A farmer, February 1st, 2017

Finally, we can ask ourselves if the nature of transition processes does not call for the setting up of generative experimental logics for co-design (Ansell & Bartenberger, 2016), in the sense of a process generating and iteratively refining a solution concept thanks to continuous feedback produced by comparing it with its effects. In our case, working with this logic allowed us to keep the tool open to enable the participants to exploit it as a resource for their own professional transition (Chapitre 2).

Beguin (2013) explains that the conditions for a design process to produce a tool that become a resource for the transformation of someone's practice are that: 1/ the designers puts the activity the tool aims to support and transform at the heart of their questioning; 2/ the designed tool is flexible, meaning it orientates future activity, but remains open so users can adapt it to their needs; 3/ the design process must be organized in the form of a dialogue between designers and users. From Beguin's point of view, this requires a very good understanding of the activity of the end-user and to take their experience and habits as far as possible into account when designing the tool. In our case, the three conditions for the tool to become a resource for farmers to be able to use it in their own thinking and changing process.

However, from our point of view, the context of agroecological transition triggers complexity and uncertainty, which should draw the designers' attention to two other aspects. First, the activity targeted by the transformation was the subject of heated debate. In fact, the farm activity targeted for transformation by the project is still debated and uncertain in this context (Plumecocq et al., 2018). Continuing the discussion among the farmers throughout the design and use process of the

tool enabled the production of a common set of meta principles that brought together the different dimensions valued by the participants in an evaluation of the situation of a farm with respect to agroecology. With these meta principles, discussion about possible pathways and strategies for change was still possible, and gave the tool sufficient stability for it to be applied in real situations of use. Lorino (2015) speaks about the necessary design of cross-functional common narratives to make collective sense of a problematic situation and continue the joint actions inside an organization without interrupting the debates about activity and individual heterogeneity of thoughts between participants of the inquiry. We think that the choice of the way the results of each farm were presented, and the way co-designers chose to use the tool (in a non-prescriptive way), facilitated the process because it allowed discussion between the farmers about the different visions of agroecology, and it gave sense to a new activity of facilitation of local farmers groups within the AVEM association. For researchers who accompany local co-design processes, this means to looking beyond the design product as an end in itself. Rather, it implies seeing it as a permanently evolving instrument of support for co-designers in the building of their representation of the problem to be solved in their activity and how to solve it.

A second aspect that deserves attention in the context of agroecological transition is that the activity to be transformed by the design appears to be a complex activity system (Engestrom, 2000). In our case, the agroecological transition was defined as a problem for farmers at the beginning of the project. Even if the problem of a divided approach to agricultural advice was mentioned right from the beginning of the project, the question of how the different advisers were going to organize themselves to design and use the global diagnostic tool was not a matter of concern for the steering committee. Only the confrontation with the use situations of the tool enabled the problem and its proposed solution to be rephrased as a problem of transformation of both farming and advice activities (Chapitre 2). In a transition context, the researchers who support the transition process of a local community system might not be able to define and frame *a priori* with the participants what activities are going to be transformed with co-design, and even if they manage to define the boundary of the activity system to be transformed, it will not be possible to predict how it will evolve during the co-design and experimentation process. This calls for keeping the co-design and experimentation process open to new participation to allow the complex system to evolve at the same time as it moves along the transition pathway.

Insights for practice

Our starting hypothesis was that setting up an ongoing process of experimentation of the farm diagnostic tool during its co-design would help to tackle the complex, open-ended and uncertain nature of agroecological transition, and facilitate the ongoing adaptation of the tool to possible changes in its use situations.

Using this framework favored a generative debate among participants between the end and means for transforming the activity of both the farmers and the advisers. It made it possible to adapt the design outputs to the shifting and complex objectives of the design and for practitioners to use the co-designed tool to transform their own practices in a framework that was defined and debated locally. It clearly made it possible for the project to go further than a standard co-design methodology, where the co-design process ends with the production of a prototype, whose relevance in its use situation is not tested during the course of the project.

However, this kind of co-design framework requires certain conditions to be fulfilled: first, it requires that the participant are open to engaging in a tentative process of design, which might conflict with their logics of action and project management habits (Chapitre 4). Second, the uncertainty and complexity of the transformation processes that are at stake locally may make it difficult to identify the appropriate group of participants to establish for the design and experimentation process, and this community might need to evolve as the process progresses. This means keeping the process open to the participation of new individuals and supporting the co-designer group in an ongoing process of reflexivity regarding to the process of transformation of which they are part. Third, setting up such logics may require long term investment by the participants and by the researchers, and this may conflict with the currently prevailing logic of funding projects for two or three years. To avoid this limitation, researchers who support local co-design processes should try to create the conditions necessary for its continuation once they leave the field. This means building people's capacity to lead and manage the co-design and experimentation process by them.

For researchers who implement design methodologies to accompany community transition, we suggest they should open the co-design process of prototypes to their experiment in real use situations, as recently suggested by other researchers in a similar context of agroecological transition (Prost et al., 2018). The experiment described here suggests it is necessary to organize ongoing experimentation during the co-design process. For design researchers, this means putting themselves in a position to accompany the co-design and use experimental processes as a generative

experiment, where the outcomes of the design feed the experimentation and vice versa. Finally, this case also suggests the interest of working with the design of objects that crystalize a representation and enable debate about the activities targeted for change. In our case, the analytical tool crystalized the debates and the representations of both the farmers' and the advisers' activity, and became a resource to transform both. All these co-design principles rely on an implicit principle we wish to highlight as a conclusion: this kind of co-design process needs to be organized locally, in direct contact with the individual and collective work situations to be transformed.

Chapitre 4

Shifting from evidence production to a pragmatic inquiry to support the agroecological transition: example of dairy sheep farming redesign

Photo 5 : L'horizon. Un éleveur de l'AVEM mène son troupeau à la pâture. Mai 2015. Source Camille Lacombe.

Contexte et insertion dans la thèse

Dans ce dernier chapitre de la thèse, je propose une analyse de la démarche mise en place au cours des trois années du projet SALSA pour mettre en œuvre la transition agroécologique au niveau local. En effet, le projet a traversé divers épisodes de crises et de déconvenues pour les partenaires du comité technique, qui ont été à l'origine d'une réorientation de la démarche même de gestion du projet vers une gestion « chemin-faisant ».

Dans l'article qui suit, je propose une analyse des différentes étapes qui ont conduit à cette réorientation en mobilisant un cadre de lecture de cette transformation basé sur le processus de gestion et de mobilisation des connaissances et des outils au sein du projet. Je montre que le projet a basculé depuis une logique positiviste, fondée sur une vision de la connaissance générique et des outils d'aide à la décision comme producteurs d'évidences pour informer la transition, vers une logique constructiviste, mobilisant l'enquête pragmatique et les outils comme des heuristiques, favorisant la construction progressive d'une intelligibilité collective des situations vécues par les acteurs et la construction de solutions testées directement dans ces situations. Cette analyse m'amène à proposer une approche pragmatiste pour gérer des projets de transition agroécologique au niveau local, ainsi qu'à en discuter les limites. Il semble en effet qu'une approche de la gestion de projet comme une enquête pragmatique permettrait de gérer « chemin-faisant » la complexité et l'incertitude des situations de transition.

Résumé de l'article 4

The agroecological transition of agriculture calls for a change in the way of thinking about agricultural production. It implies developing local solutions adapted to the singularity of farmer's situations and enhancing the social, economic and ecological potential of local environments to design sustainable farming systems. These solutions need to be co-created by scientists and the actors concerned by the problem using participatory research methods. Today, this kind of participatory approach follows either a positivist or a constructivist logic. The positivist logic aims at supporting co-creation by producing generic knowledge (evidence-based approach) using decision support tools. The constructivist logic relies on collective deliberation and experimentation (pragmatist approach) directly in the problematic situations to create and test workable solutions. It makes use heuristic tools that help grasp the complexity of the situations faced by local actors. In this paper, we analyze the shift from an evidence based to a pragmatic approach in a local project of agroecological transition led by a group of dairy sheep farmers and their advisers in France. We show that this shift was triggered during the co-design process when the agroecological diagnostic tool and its co-designers were confronted with the complexity and diversity of situations of use by farmers dealing with transition. Based on the analysis of this case, we discuss the advantages and limits of implementing a pragmatic approach for the management of a local project of agroecological transition. This approach is a promising way to deal with the complex and undetermined nature of agroecological transition.

Article 4

Shifting from evidence production to a pragmatic inquiry to support the agroecological transition: example of dairy sheep farming redesign

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Introduction

Agriculture is in crisis. Agricultural intensification has had a series of unexpected negative effects, particularly on the health of consumers and the environment. The majority of citizens of European countries judge that the situation has become untenable and that agriculture must engage in a sustainable transition (De Schutter, 2014). Although the verdict is shared, the objectives to be achieved and the means to achieve them are not. Thus the question arises of how to accompany what appears to be an open-ended transition.

The sustainable transition of agriculture calls for a change in the way of thinking about agricultural production. As Einstein put it, "We can not solve our problems with the same level of thinking that created them". Agroecology offers a framework for thinking about this transition by proposing that agricultural production be a product of the functioning of an agroecosystem. This implies developing solutions adapted to the singularity of the situations and exploiting the ecological potential and consequently local economic and social factors. The re-design of the agricultural activity needs to be tackled using a systemic approach.

The farm in its environment can be represented as an open socio-technical system (Emery, 1982) in which the system interacts with its environment. The challenge of redesign is therefore to integrate the co-evolution of the system and its environment. According to Checkland and Holwell (1998), co-evolution is all the more obvious when the systems include a strong social component. Socio-technical systems evolve under the effect of social interactions, intersubjectivity and the performativity of discourses. The way in which it is analyzed evolves in parallel with the evolution of value systems (Checkland & Holwell, 1998). This social dynamic is thus too complex to be modelled. Consequently socio-technical systems are never fully knowable. Sophisticated data processing using modeling will not make any difference. A complex system is not explainable in the sense that it is impossible to produce a true representation of it (Le Moigne, 2010). As a result, it is impossible to identify optimal solutions, and even more impossible to implement them in the certainty they will produce the desired effects and only those. Disposing of more time and analytical power will not make any difference. A finer analysis of the system will not produce solutions, as these are more likely to be identified by accompanying the process of change of the system. At the heart of this process are changes in the practices used by the actors of these systems. These changes in practice will be sustainable if they are accompanied by a change in the reasoning and their underlying values. This is why Checkland suggested replacing common optimization approaches in engineering with a logic of learning that accompanies the transformation of the system (Checkland and Holwell 1998, p258). Like Argyris (1996), this led him to consider that the problem solving process must function in

a specific social situation, using a participatory approach involving both researchers and the actors of the situation. It is also necessary to put the hypothesis into practice and to collectively think about what it produces in order to promote reflexive learning (Dyke, 2009)

In Lacombe et al. (2018), we show that co-design involves is a diversity of practices. Among practices that support learning, it is possible to distinguish an epistemological break. Co-design practices can be anchored in a positivist epistemology that dissociates the production of true knowledge from its use to transform the world. This is the case of "De novo design", the objective of which is to design innovative farming system ideotypes to implement in the real world (Lefèvre et al., 2014; Moraine et al., 2014). Other co-design practices can be anchored in a pragmatist epistemology, aimed at basing the re-design process on hypotheses that will be validated - or not - through experimentation in the real world, directly in the situation to solve. This is the case of projects anchored in practices of co-innovation, participatory action research and activity centered design, which move with iterative logic between the production of knowledge and the testing of this knowledge directly in the field (Albicette et al., 2017; R. Hill et al., 2007; Tittonell et al., 2012; Vänninen et al., 2015).

Any re-design process begins with an abduction phase. Abduction is the logical inference that passes from the surprise related to the realization that a system is not sustainable to the formulation of the hypotheses on the origin of the problem and how to remedy it (David, 1999). For example, Coquil et al. (2017) states that awareness of a gap between values and actions commits the farmer to change the way he or she works to regain lost coherence.

From a positivist perspective, problem solving is an evidence based process. It consists in mobilizing the evidence that will make sense for the actors of the local problematic situation. That is to say, building solutions based on generic knowledge. In the absence of such evidence, the idea is then to produce evidence outside the problematic situation in particular by a hypothetico-deductive approach of controlled and randomized experimentation or data-mining / systemic reviews (Patsopoulos, 2011). The design process and the production of knowledge are then thought to be dissociated from the action (Mitchell & McCullough, 1995). The action is evidence based. It proceeds from a logic of bringing reality into line with knowledge. Knowledge is hardly questionable because it is thought to be a true copy of reality: i.e. evidence.

The pragmatist perspective calls for undertaking an inquiry directly in the situation. The hypotheses are produced during collective reflection, calling on all kinds of knowledge. The hypotheses are then tested in the action. The knowledge is validated by the fact that the

consequences of the action are those sought. It is a capacity for action that remains contextual and has value only in the problematic situation. It is a guaranteed assertion (Dewey, 1938) that, from a contextualist perspective is the only possible form of knowledge. Knowledge production and action are intimately linked and form the pragmatic inquiry.

Both approaches can be tooled by computer or conceptual modeling. In the positivist approach, the tool will try to represent the reality as a decision support tool (DST). In a pragmatist approach, it will be a heuristic, helping to think about the complexity of the situation, that is employed by the individuals to build assumptions of action that will enable them to learn in the situation.

In this paper we show how, in a test of the agroecological transition, an evidence-based approach based on the construction of a DST, the SALSA project, turned into a pragmatic inquiry based on a heuristic tool.

Material and Methods

Case study

The SALSA project began in 2013 on the initiative of the AVEM association which groups 160 livestock farmers (mainly dairy sheep breeders) and their advisors (3 veterinarians and an agronomist), located in the South of France (Figure 1). The objective of the project was to start an agroecological transition on the dairy sheep farms of the territory. The local context was characterized by an acceleration of intensification of milk production in the Roquefort area, due to the recent reorganization of the supply and processing chains. The farmers, who were members of AVEM, felt that they were losing self-sufficiency because their farm resources no longer allowed them to feed their own herd. They referred to this concept as “l’équilibre sol-troupeau” (the balance between soil and herd). A group of eight farmers who were members of AVEM translated the concept into the amount of milk that could be produced without purchasing either feed or other inputs like fertilizers (technical autonomy) or diesel fuel (energy autonomy), i.e., the natural carrying capacity of the farm. Two of these farmers were members of the board of the AVEM association and they suggested creating a project in response to a call for projects by the French Ministry of Agriculture on Agroecology. Together with a veterinarian from AVEM and a researcher from INRA (Laurent Hazard) these farmers wrote the proposal for the SALSA project that was selected and funded for a three year period (2014-2017). The rationale behind their project was that an agroecological transition of dairy farms should be fostered by a quest for autonomy. The project acknowledges the high degree of disparity between farms with regard to autonomy. Increasing their autonomy was hindered by their lack of overall understanding of the sustainability of their farming

systems because extension services are fragmented and provide highly specialized advice without a systemic and long term vision. To overcome that problem, the proposal was to build a general farm diagnostic tool based on assessment of the agrocological performance of farms co-designed by farmers and project partners. The project would then undertake a diagnosis of AVEM farms to identify virtuous practices and the levers of action needed to begin the agroecological transition and get volunteer farmers to re-design their practices and monitor the changes they made. Partners in the project were selected for their knowledge of the challenges faced by the region and its dairy sheep production systems. The partners were CETA "de l'herbe au lait" (organization responsible for technical and economic monitoring of dairy sheep farms in the area), the Grands-Causses Regional Natural Park (organization for protection of the environment and valorization of the territory and its resources), the Saint-Affrique Agricultural High School (school for secondary and adult professional education in the territory which has its own experimental dairy sheep farm), and the French National Agricultural Research Institute (INRA) (AVEM's long-time partner in fodder autonomy projects). These partners all became members of the project steering committee. Among other things, the project funds made it possible to finance a project facilitator for the three years, and the role was taken by the agronomist of the AVEM.

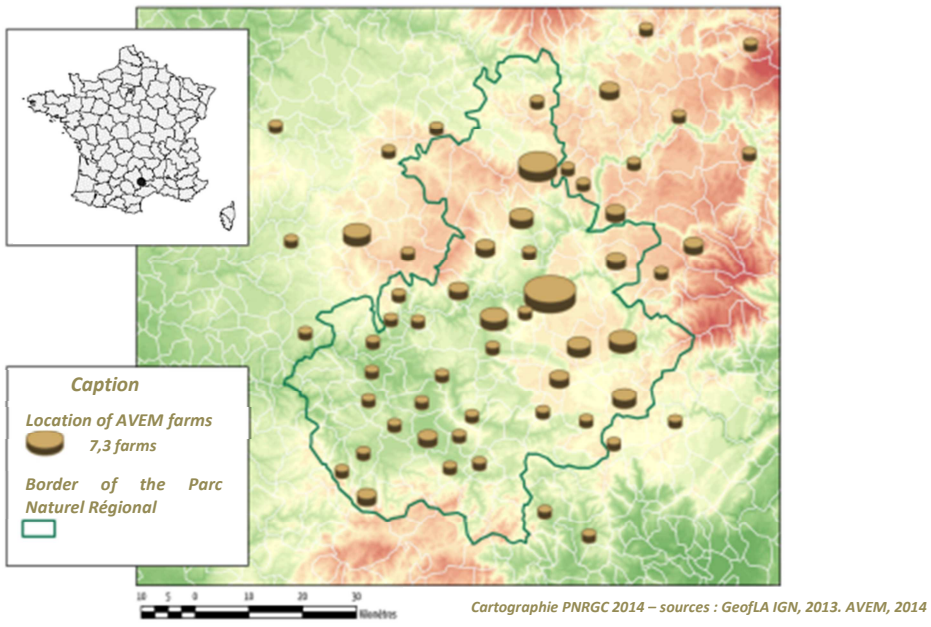

Figure 1: Location of AVEM farms, inside and outside the Grandes Causses Regional Park
(the size of the disk represents the density of farms).

Research strategy

We (the authors of the paper) implemented an action research methodology in the project (Lewin, 1946). Action research is a process that "results from an involvement by the researcher with members of an organization over a matter which is of genuine concern to them and in which there is an intent by the organization members to take action based on the intervention" (Eden & Huxham,

1999). Concretely, we were involved in the project in two different ways. First, we took an accompanying stance in the process of co-design of the tool, seeking to direct it toward greater consideration of its use situations with breeders (Chapitre 3), but without seeking to take control of the process. In the second step, we took a more active stance in the task of redesigning the farming systems for which we were responsible, with the aim of proposing a method of facilitating activities on the farms using the diagnostic tool in a different way from that planned at the beginning of the project.

Our active involvement in the field enabled us to take part in the project while simultaneously reflecting on and analyzing what was happening within our interdisciplinary research group (a researcher in agroecology, a researcher in organization sciences, and a PhD student at the crossroads between the two disciplines). All the meetings, workshops and day sessions on the farms were recorded and the PhD student kept notes of her interactions with the different project partners, especially during the intervention phase, when she accompanied the project facilitator in the use of the diagnostic tool on the farms.

This paper is a retrospective analysis of the whole project consistent with the analytical framework that was the product of our own reflexivity around the SALSA project and a comparison with the literature on the agroecological transition and the transformations it involves.

Analytical framework

To elucidate the epistemological break that occurred in the SALSA project, we use a heuristic scheme (Figure 2). The dotted vertical line symbolizes the epistemological break between positivism and pragmatism. Positivist epistemology considers knowledge as a true representation of reality. In the action, implementing the transition becomes self-evident (Duru et al., 2015). Pragmatism is part of a constructivist epistemology in which knowledge is a social construct that is constantly renewed and transformed into a situation. In the action, it has the status of interpretations or hypotheses to test. Testing gives rise to a re-appropriation and the continuous transformation of knowledge. The transition thus takes the form of a local pragmatic inquiry (Dewey, 1938; Metcalfe, 2008).

The transition built on evidence based logic relies on normative tools, producing evidence to guide the actors in their decisions. The transition built on a logic of pragmatic inquiry, rather relies on heuristic tools, that are supposed to help the actors understand the complexity of the situations they are experiencing (Savolainen, 2006) and to instrument their actions by building hypotheses of action to be tested in their activity (Lorino, 2002). We analyze the different stages of the SALSA project using this analytical framework.

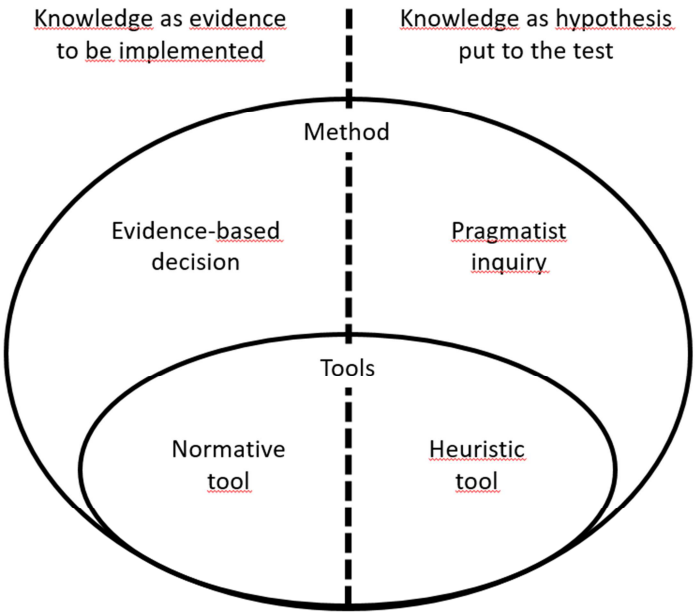

Figure 2: Analytical Famework.

Results

Solving the problematic situation led to designing a tool to objectify and increase farm autonomy

The project followed an evidence based strategy. The first step was to design a general farm diagnostic tool. This tool was planned to be used to characterize the farms to prove that the greater the autonomy of the farming system, the better their environmental and economic performances. If such *evidence* was provided, it would encourage farmers to undertake the redesign of their farming systems to achieve more autonomy and adopt environmentally friendly practices. Moreover, working on the validation of this hypothesis was expected to identify the virtuous practices that would help transform the systems.

Designing the tool led to debated reductions and built a normative representation of the agroecological transition to be implemented

On the one hand, the design of the tool to assess farm autonomy led to a series of approximation and to debated reductions. The farmers on the technical committee suggested building a tool based on CETA expertise, as a tool had already been used to optimize the technical-economic performances of farming systems. Designing a model to estimate the autonomy of a farming system proved to be very difficult for the technical adviser of the CETA. His difficulty centered the project on the design of a tool, orienting the project toward a more reductionist logic (Figure 3). The challenge was to estimate 'autonomous' milk production vehicled by the farming system without purchasing feed or

other inputs to improve agricultural production. While the CETA adviser had no problem in estimating milk production with no extra feed purchased outside the farm, he was initially unable to estimate it without external inputs to improve crop and pasture productivity both directly (fertilizers, etc.) and indirectly (diesel fuel, etc.). Part of the difficulty was that such a farming system with no inputs questioned his model of a farm as a unit that transforms inputs into goods (Figure 3).

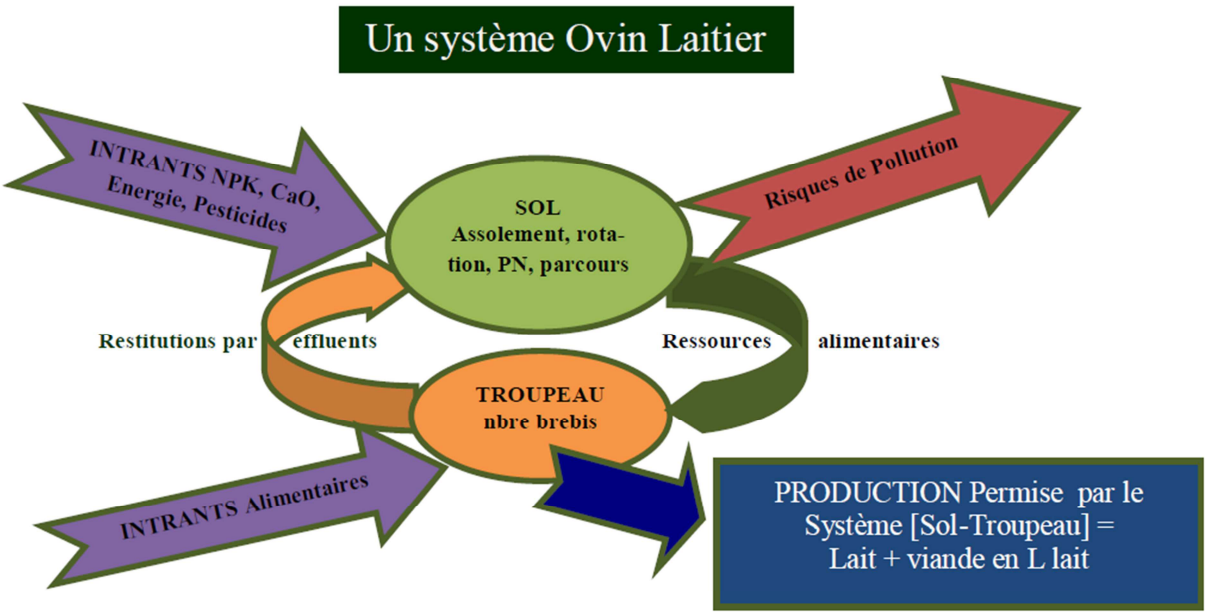

Figure 3: Scheme of the farm model that was used by the steering committee at the beginning of the project to discuss the tool to assess farm autonomy.

On several occasions, he revealed his own normativity, by stating, for instance, that using a small quantity of chemicals to optimize on-farm forage production was far better than buying and transporting alfalfa hay on long distances. But his difficulty was mainly a technical one: he had no reliable *evidence* to objectify the gain in productivity due to inputs used for different crops and forage grown on the farms.

Moreover, the design process led to approximations and conversions that allowed, for example, the meat produced by the system in the form of culled ewes and lambs to be transformed into liters of milk. It also gave rise to over-simplifications that were subject to debate, for example the fact of taking farm rangelands out of the calculation of on-farm feed production. Two reasons were given for this exclusion: on the one hand, it was difficult to estimate the contribution to milk production by rangelands, and, on the other hand, the farmers thought that the quantities their rangelands produced were so small they contributed very little to the autonomy of the farms.

On the other hand, the design of the tool to assess the environmental impact of the farming system focused only what was measureable. In fact, the process of design started with a debate about its form. The researchers' proposal was to build a model based on the ecosystem functionalities of the agroecosystem. The purpose was to try to create functional links between farming practices and environmental results and to build a bridge between the environmental evaluation model and the previously described farm model. The Regional Park officers refused this proposal. The functional approach in relation to the notion of ecosystem services seemed to them too far from the indicators they usually used to characterize the state of the environment. Their priority was to choose a limited number of indicators that made sense to them and that were easy to assess, since their intention was to be able to monitor the effect of agricultural practices on a long-term basis. The debate then shifted to the type of indicators to choose to assess the impact of farming systems on the environment: indicators of state and/or indicators of practices. The farmers wanted indicators that qualified their practices according to their assumed environmental impacts. The goal was to create a tool that could easily show farmers the best practices to use to be sure of getting a high environmental score. One the veterinarians from AVEM consequently suggested reworking a grid mainly based on the practice indicators used by AVEM to measure the farm sustainability. This proposal won the support of the farmers on the project committee because it allowed very concrete discussion of the criteria to be measured. A lot of work was done on the choice of indicators and their respective weighting. For some indicators manure management, a negative score could be given. The significance of this negative score was extensively debated finally without its principle being called into question. The weighting also led to a debate on being organic or not, since it clearly favored organic farming. A few corrections were made to try not to directly disqualify conventional farming systems since the purpose was to be inclusive and to encourage all the farmers to engage in a transition toward autonomy.

At the end of this first phase of the project, the assessment of the autonomy and the environmental impact of a farm were reduced to one score each. These scores made it possible to classify the farms with respect to each other. The difficulty was to create a simple way of presenting the results since the work done failed to build a causal link between the way in which autonomy is achieved on a farm and its environmental impact. The project committee decided to present this relationship in the form of an orthonormal system with an axis of autonomy and an axis of environmental impact (Figure 4).

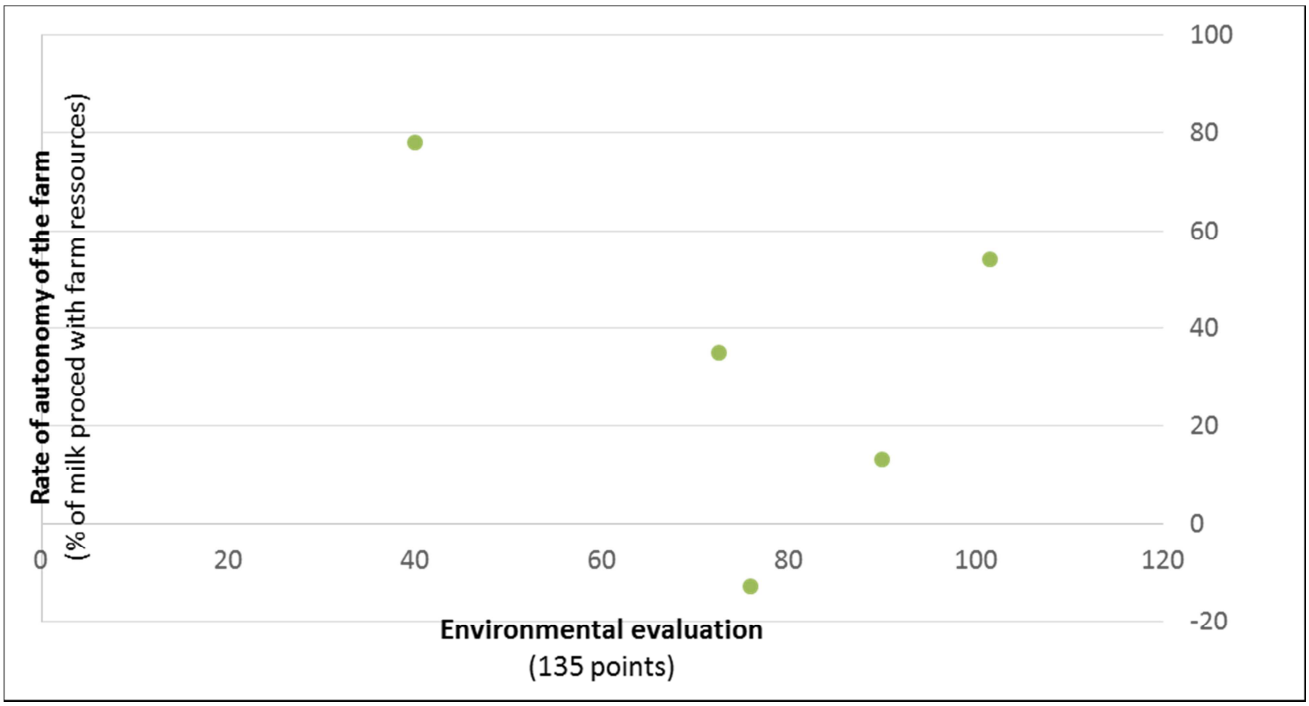

Figure 4 : Positioning of five farms with respect to the degree of autonomy of the farm and the results of its environmental assessment. The top right represent the ideal situation to reach according to the farmers on the technical committee.

This graphic representation created an implicit relationship between the two scores and designated a virtuous quadrant: that of autonomous farms whose impact on the environment was low. At this stage of the project, the tool had become the above graph, which is quite normative.

Using the tool revealed that project aims were not shared by the targeted farmers

On several occasions, when designing the tool, the project facilitator tested it on farmers who had not been involved in its design. Some of these farmers strongly disagreed with the management philosophy of the tool that ignored the social dimension of sustainability. In their opinion, the best farming system was one that allows the most people possible to live on a farm with little impact on the environment, regardless of its level of autonomy. These unexpected frustrations were summarized and translated into the need for extra indicators on well-being and employment.

This feedback was reinforced by a survey of the farmers targeted by the project by the researchers. The results revealed a wide range of practices, situations and projects among the farmers who were members of the association. Additionally, quite a lot of farmers were already moving toward what they believed to be more agroecological farming systems. The quest for more autonomy was not always their main preoccupation, nor the goal they wished to reach (e.g. organic farming, conservation agriculture, processing their products on their farm to develop a local food system).

These two encounters made the steering committee aware of the different of ways of thinking and the lack of adherence to the project. As a result, they organized four workshops with the farmers to present the project, the tool created and the first results of its use on 10 farms. These workshops created other arenas for discussion of the strategy chosen by the project creators than that of the steering committee. The farmers of the steering committee presented the project and the results of the diagnosis conducted on their farms compared to those of the other farms that had been diagnosed. This presentation by their peers led to a broad and lively debate among the farmers about the relevance of the diagnostic tool and the way to use it. At the same time, they confirmed their interest in comparing their own situation to those of their neighbors or their fellow dairy sheep farmers. The tool triggered discussion between farmers about their own global vision and farm management strategies. The workshops thus confirmed the need to have a global vision of the situation of their farm as expressed in the original project proposal. They also validated one aspect of the strategy, discussion between peers as a way of identifying and promoting agroecological farming practices.

Demonstrating that the link between autonomy, the economy and the environment is a social construct among others confirmed the failure of the evidence based strategy

The statistical analysis of the data collected on the 25 farms failed to find a significant correlation between farm autonomy, its environmental score and its economic performance assessed by the gross margin. It was consequently not possible to highlight virtuous practices linking these different dimensions. Rather, the analysis highlighted the coherence of practices applied in the different systems when investigated in relation with the farmers' strategic priority: to increase their autonomy, to increase employment on the farm, to maximize milk production, and to maximize income by uncoupling plant and animal production and to sell cereals at a good price even if you purchased fodder for the animals, etc.

The analysis also revealed that the coherence between autonomy, and the environmental, economic and social dimensions was partly a social construct and not the expression of an underlying generic law. However, the absence of a general law based on this one-off analysis says nothing about the relevance of wanting to increase one's autonomy as a way of improving the whole set of dimensions considered.

The tool became a heuristic to discuss and engage in making changes on the farms

During a steering committee meeting in the middle of the three year project, the project partners expressed their surprise at the heterogeneity of farming systems and farmers' projects. A few months later, the four workshops to present the tool and the project to the other farmers in the

association were held (at the end of 2015), and the technical committee discovered that the tool was an interesting basis to discuss the situation of one or more farms collectively (Lacombe et al., 2016). In the meanwhile, the statistical analysis had not produced the expected results. It was at this time of general disappointment that the researchers were obliged to take over the direction of the project to propose a facilitation methodology on farms. Based on the observations they had made during the workshops, they suggested using the tool as a heuristic to work with local farmers' groups on their individual goals for their farms and to define the strategy to reach them (Figure 5).

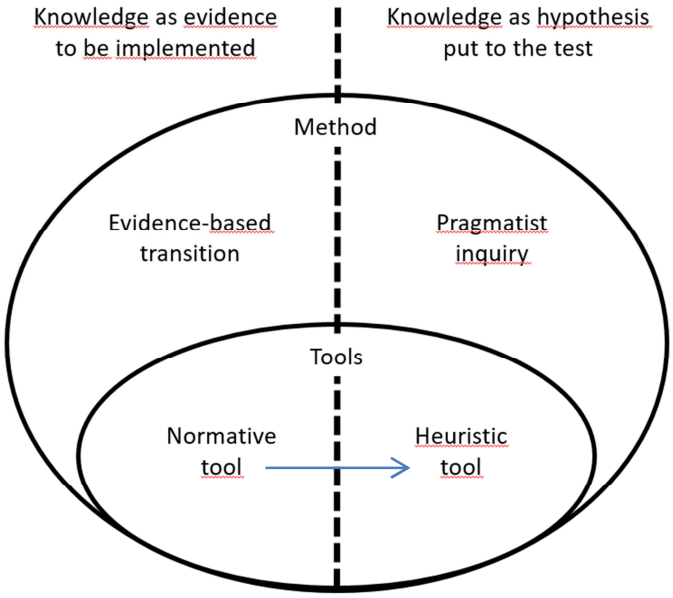

Figure 5: Shift to a more constructivist logic for the project: using the tool as a heuristic to facilitate discussion among the farmers

The researcher and the project facilitator organized and moderated three groups of volunteer farmers to promote reflection and changes toward agroecology. They used the tool to contribute food for thought to the discussion. Each group was composed of farmers who volunteered to think about the changes they could make in their farming systems. Some farmers were already involved in a process of change or about to begin and they were more interested than others to discuss it with the group to better grasp the impact it would have on their overall activity in the medium and long term. Three sessions of collective work were proposed as a start. The first session was held on a farm whose owner wanted to discuss his plans for change with the others. The whole day was dedicated to reaching a collective understanding of the situation of the farm and comparing it with the situations of the other farmers attending the session, using the diagnostic tool as a support for discussion and comparison. At the end of the session, the group decided on the direction they wanted the re-design work to take and which topics they considered relevant to inform their ongoing or future processes of change. The second session took place on a farm that was chosen for its

relevance to these topics. The third session would be another visit to a farm, or a session to simulate and discuss relevant changes to be implemented on a farm belonging to a volunteer.

During these sessions, the tool was used as a support for the discussion and comparison of farmers' individual strategies and choices, but also to help farmers think about the possible changes they could make or were already making on their farm. It was also used as a simulation tool to enable discussion of the changes one farmer was already making or wanted to make. The global picture it provided of a farm situation (technical and economic efficiency in the use of inputs, environmental impacts of farming practices, social and economic evaluation of the farm) allowed the groups to discuss all the aspects in one session, which was very useful for the farmer whose case was being discussed as it enabled him to envisage the situations his farm could be in as a result of the changes he wanted to make. For example, one of the farmers whose case was analyzed in group 1, who, with his wife, was changing the dairy period on his farm explained: "it clearly helped us to build a global picture of what we could expect from the changes we were making" and that "it was really reassuring and useful" (Florian, November 29, 2017).

The overall strategy of the project took the form of a pragmatic inquiry

Meanwhile, the researcher and the project facilitator were moderating the local group dynamics and wondering how to capitalize on the experience they had gained with the volunteer farmers in the association, both with the steering committee members and with the members of the decision-making body of AVEM. They tried to organize or participate in collective reflexivity on the experience they had with farmers in the two groups. At this moment in the project, they urged the project into a pragmatic inquiry logic. For example, the researcher organized a session to show partners in the SALSA project who did not attend the sessions on the farms what had happened, using a montage of the video recordings made during the farm sessions (January 11, 2017). A few months later, one of the points that came out during the final discussions between the partners on the project outcomes was that the way of working in the project made it possible to review the tool and its use as they went along (Chapitre 3). Additionally, it gave the farmers the opportunity to use the tool themselves to pursue their own questioning about their farms. At the end of the project, the partners wanted to continue monitoring and thinking about the tool and how to use it to be able to analyze "how it evolves" and "how it is used by the different partners in the long term "(cf. final meeting on March 20, 2017). Another opportunity for reflexivity about the work undertaken during the SALSA project was at meetings with the AVEM's administrative board on several occasions in 2016 and 2017, when the project facilitator reported on the progress of the project. During specific working meetings to think about the sustainability of agroecological monitoring at AVEM, the members of the board

decided to continue the small group facilitation started during the project and to use the diagnostic tool during the sessions if the farmers in the groups so desired.

Discussion

The positivist paradigm and the instrumental vision largely dominates the way of thinking about the transformation of agricultural systems. Our case study shows that the scientific approach is not the exclusive preserve of researchers. Farmers and advisers refer to 'scientific approaches' when shaping a project to transform their farming systems. This is not surprising because, in France, farmers are 'immersed' in this scientific culture through their professional training and by the scientific foundation on which the agricultural productivist model is based (Noulhianne, 2016). Farmers, but especially their advisors and facilitators, are also very familiar with project in the sense of project management or in the managerial sense of the term (Garel, 2003). That is to say, to define objectives and the method to achieve them, as well as a strategy that is linear in the short term. This logic prevails, for example, when it comes to financing new actions for farmers and facilitation time for facilitators of farmer groups. What provides the proof of reasoning in this innovation regime is evidence: bankers and advisers base their assessment and advice on references. The references, in this case, are generic knowledge (reproducible, repeatable) that frame the action. The mode of production of these references varies: logical reasoning (mathematical, economic equations, syllogism etc.), controlled experimentation and systematic review (Patsopoulos, 2015). This is the logic that prevailed at the beginning of the SALSA project, when the farmers and their advisers proposed to work on the construction of a farm diagnostic tool to objectify individual situations and to highlight action levers to improve practices based on statistical analysis.

The evidence based approach seems to contradict the very nature of the change to accompany in the case of the agroecological transition. Agroecology is a contested and unstable (Cancian, 2015), which calls for the production of knowledge rooted in the experiences of farmers and the knowledge of practitioners (Chrétien, 2013; Mayen, 2013; Olry, 2013a). Using normative approaches that are cut off from the action of practitioners to develop more sustainable farming systems therefore seems to contradict the principles of agroecology. In the case of the SALSA project, construction of the tool by the project partners was repeatedly confronted with the complexity of the problem that the tool was supposed to solve. For example, on the environmental side, the choice was made to base the representation on a multi-criteria evaluation of the impact of practices on the environment. This choice means only measurable indicators can be taken into account. Several important dimensions were not taken into account in the diagnostic tool: the use of rangelands on farms, or the different types of milk selling channels, which were "taken out" of the system, because they were considered

by the farmers to be independent of milk production. Finally, the diagnostic tool did not allow an objective and faithful representation of reality, and the levers of action revealed by the statistical analysis were weak. Another example is the absence of a social component at the start of the project. Another model than that of an autonomous, economically viable and environmentally friendly farm emerged from the discussions that took place during the workshops with farmers who were not on the steering committee: for example, a farm project that would put job creation first. Without taking the choices and individual situations of farms into account, it is difficult to consider the model depicted by the original tool as ideal. These differences led the project partners to adopt another logic for the design of the tool and its use: shifting from a logic according to which the tool "formulates" recommendations for change, they developed a logic in which the tool is developed and used as a support to accompany individuals in the construction of their own pathways of change.

The SALSA project for the agroecological transition of farms changed and a pragmatic approach was adopted along with a different methodology for the use of the tool from that planned at the beginning of the project. The implementation of knowledge produced in a positivist logic does not help practitioners in their own actions (Argyris, 1996): rather it is necessary to implement intervention approaches that produce knowledge on how to create action devices that work. In our case, it was about informing practitioners, breeders and advisers on how to build devices that allow them to drive their own change, rather than producing solutions for the management of change. The diagnostic tool co-designed as part of the SALSA project became a heuristic tool for farmers and advisers who used it whereas its users considered it did not represent farm reality but rather used it as a support to help them think about the complexity of their changing situations. Lorino, building on an image developed by Simon (1969), talks about seeing tools as complex conceptions, and that commitment to action leads to defining new objectives for the user's activity. He draws a parallel between the development of tools and the realization of an oil painting where "each new touch of color placed on the canvas creates a kind of organization that provides a continuous source of new ideas to the painter" (Lorino, 2002).

The pragmatic approach poses the question concerning the composition of the group in charge of producing and validating knowledge in action in a richer way than the evidence-based approach. At the beginning of the project, we started with a small group of people around a project of transformation of agricultural systems. The fact that only a few people were involved in the design and implementation of the project is in line with the original project strategy. It was to test the hypothesis that autonomy and economic and environmental performance were true. From a positivist perspective, confirmation of the hypothesis would have allowed it to be used as

undisputable evidence that everyone would be obliged to accept. The failure of this strategy led the group to adopt a new strategy closer to the pragmatic inquiry. Adopting this constructivist perspective raised the question of the need to involve a larger number of farmers in the inquiry process. This problem was all the more important as we realized that some of the farmers did not share the vision of the farmers on the steering committee for the project for the transformation of their systems: some farmers believe the model of agroecology is a social model that enables a large number of workers to continue working on the farm, even if this means buying food for the animals and maintaining a high level of production to be able to pay the workers. What is more, if at the end of the project about 30 farmer members of the AVEM had taken part in the project, this represents a minority of the 160 farms who are members of AVEM. A pragmatic inquiry is an ideal form of participation by the whole community concerned by the problematic situation. In an ideal democratic society, all the members of the affected community (the public) would build solutions step by step by discussing their own experiences and observations with others (Dewey, 1927, 1938). However, this ideal is all the more difficult to achieve because, in our societies, the development of a technocratic form of problem management, in which the solutions are proposed by the experts, has disengaged citizens. As a result, few citizens today invest time in meaningful democratic deliberation leading to their own emancipation (Wagner, 2011). In our case, keeping this community open to the participation of new breeders in the reflection over the course of the project, allowed it to evolve from a form of rational myth of the agroecological transition of the farms in this particular territory towards a more anchored way of accompanying the transition, but also more open to the diversity of points of view and debate.

Finally, one may wonder if such an inquiry process is not the best way to manage a project. In our case, the logic of the project changed from what was originally planned. This was supported by several elements: 1 / of surprises and unforeseen elements during the project to review the objectives and actions planned (it has been the case during the presentation workshops of the tools and the project to the breeders of the association for example); 2 / creating a back and forth dynamic between the design and the use of artifacts directly in their use situation; 3 / the construction of a dynamic of reflexivity within the project. These three elements all go against the project approaches that prevail today in agricultural development. The implementation by the project leaders of the different principles mentioned above would require more flexibility on the part of project donors. In practice, donors usually require that the results, means and steps are clearly defined when the project is first drafted. Project management is then framed by reporting, which is limited to providing evidence that the steps have been completed. Implementing pragmatic inquiry also requires engaging in an undetermined open-ended process whose means and ends are reviewed whenever

necessary. Knowledge is no longer the objective to be achieved but an instrument of action in the process of change. However, as noted by Roberts (2000), facilitators, researchers and people in general are not comfortable with this mode of management because they have not been trained in it. In addition, implementing a dynamic of reflexivity over the project during its implementation is not easy for practitioners who often lack the time to take a step back from what they are doing. Implementing the idea of "reflexive practitioner" developed by Schön (Schön, 1983) requires providing the project management with time and opportunities for reflexivity. Involving researchers who develop participatory research methodologies from a constructivist perspective is one way to support projects and practitioners in the construction of a path-making reflexivity (Steyaert et al., 2016).

Discussion Générale

Photo 6: Discussion. Echanges autour d'une prairie semée. Automne 2016. Source Camille Lacombe

Mon travail de thèse visait à analyser la façon dont la transition agroécologique conduit à revisiter l'accompagnement des changements en agriculture, et à identifier des façons de construire et mettre en œuvre cet accompagnement au niveau local. La stratégie de recherche que j'ai mise en œuvre au sein du projet SALSA, alternant participation-observante et recherche-intervention m'a permis d'appréhender simultanément ces deux dimensions du problème. A l'issue de ce travail, je développe la thèse suivante : l'accompagnement local des processus de changement au sein de l'activité des agriculteurs, dans une perspective de transition agroécologique, nécessite de mettre à disposition des individus les moyens et les ressources utiles à leur propre développement. Ce développement se fait en articulation avec un projet partiellement défini et conçu (mais surtout débattu) collectivement. L'accompagnement doit donc également permettre la construction et surtout la mise en débat de ce projet au niveau collectif.

Dans un premier temps, je discuterai le concept même d'accompagnement et ses développements en agriculture, afin d'en proposer une approche pragmatiste pour l'accompagnement local d'une transition agroécologique. Ensuite, je développerai une proposition méthodologique pour l'activité d'accompagnement de la transition agroécologique dans le cadre de cette perspective pragmatiste. Enfin, je reviendrai sur la démarche mise en œuvre pendant la thèse au sein du projet SALSA, pour en discuter l'intérêt et les limites, en m'interrogeant notamment sur les contours d'un dispositif local d'accompagnement de la transition agroécologique.

Une approche pragmatiste de l'accompagnement de la transition agroécologique

Pour Beauvais, accompagner veut dire : « Se joindre à quelqu'un pour aller où il va en même temps que lui » (Beauvais, 2004). L'accompagnement inclurait cependant une double dimension de relation et de cheminement, liée à une idée de rattachement à un sens partagé et à une communauté (Paul, 2002). Sur le plan scientifique, cette notion a été essentiellement développée pour expliquer une relation interindividuelle entre un accompagnant et un accompagné, et pour réfléchir à la posture et aux activités des accompagnants dans cette perspective (Ardoino, 2000; Paul, 2002). Cependant, elle reste floue et en mouvement, notamment parce qu'elle est utilisée différemment selon les secteurs d'activité, et qu'elle peut recouvrir une diversité de positionnement vis-à-vis de l'expertise et de la mobilisation des connaissances. Entre l'activité du coach sportif et celle du soignant qui accompagne la fin de vie, « la nébuleuse » de l'accompagnement reste difficile à appréhender (Paul, 2002). Les auteurs qui ont travaillé sur le développement de cette notion s'accordent cependant pour dire qu'une façon de la définir en partie est de considérer que l'activité d'accompagnement relève avant tout d'une certaine éthique pour l'accompagnant (Ardoino, 2000;

Beauvais, 2004). L'éthique correspond à une démarche intellectuelle individuelle qui vise à se poser des questions sur ses propres valeurs, le sens que l'on donne à ses actions et sa place dans l'existence (Coutellec, 2015). Pour Beauvais (2004), il s'agirait pour l'accompagnant de s'inscrire dans une vision de l'Homme comme sujet responsable et autonome dans sa pensée comme dans ses actions. Ainsi, accompagner ne serait « ni assister, ni décider, ni agir, ni assumer à la place de l'autre », mais plutôt «aider l'autre à se décider, à agir, et à (s')assumer, notamment en pensant des cadres susceptibles de favoriser son engagement et sa responsabilisation et en adoptant des postures susceptibles de l'aider à « se prendre en projet » dans son environnement ». La notion d'accompagnement met donc complètement au centre de la démarche de l'accompagnant le soutien de l'individu dans la construction autonome de ses propres projets de changements, lesquels se définissent dans une interaction permanente avec la(les) communauté(s) au sein de laquelle (desquelles) il chemine. La façon dont se définissent les cadres dont se dote la(les) communauté(s) en question reste peu abordée, tout comme le rôle de l'accompagnant dans le soutien de cette construction collective.

Paradoxalement, dans le domaine agricole, l'emploi du terme accompagnement est relativement récent, à part au sein du réseau CIVAM qui s'est développé dès les années 140, et les activités des accompagnants sont plutôt rapprochées d'activités d'animation de dynamiques collectives. Le réseau CIVAM a basé son action en termes de développement local et agricole sur les principes de l'éducation populaire, et, depuis ses origines, situe ses actions de soutien au développement agricole local comme des actions d'accompagnement (Follet-Sinoir et al., 2013). Les CIVAM positionnent en grande partie le travail des accompagnants comme un travail d'animation de groupes d'agriculteurs (Lusson & De Marguerye, 2013). Avec le développement de l'agroécologie comme nouveau paradigme pour construire des systèmes agricoles plus durables, l'emploi du terme « accompagnement » est le plus souvent mis en lien avec des compétences d'animation de collectifs d'agriculteurs ou d'acteurs locaux, dont l'objectifs serait de produire les connaissances, les innovations et les nouvelles coordinations nécessaires à la construction de systèmes agricoles plus agroécologiques (Albaladejo et al., 2010; Duhamel et al., 2017; Lusson & De Marguerye, 2013; Olry, 2013b; Petit et al., 2010).

Partant de ce constat, l'objectif de cette thèse était bien de s'appuyer sur une vision conjuguant conception collective et construction autonome des projets individuels des agriculteurs pour engager l'accompagnement du changement. Dans le cadre de projets locaux de transition agroécologique, où une des questions centrales pour les animateurs est souvent d'amener le groupe de participants à construire un projet commun, il me semble qu'aborder les choses en accompagnant, au sens premier

du terme, décale en partie cet objectif de facilitation de l'émergence d'un projet partagé vers la facilitation du processus de co-évolution entre un projet collectif et les projets individuels. La question, avec la perspective que je propose, ne devrait plus tellement être « quel est le projet de transformation de l'agriculture autour duquel le groupe se retrouve ? » ou « quel est le problème commun à résoudre », mais plutôt « comment mettre à disposition des individus les moyens et les ressources pour leur propre développement dans le cadre d'un projet ou d'un problème défini, conçu (mais débattu) collectivement ? ».

Je situe cette proposition à l'intersection de deux cadres théoriques que j'ai mobilisés pour construire ma propre compréhension de ce que recouvre la notion de transition agroécologique : celui du développement autonome des individus (Varela, 1978) et celui de l'enquête pragmatique (Dewey, 1938; Metcalfe, 2008). Comme je l'ai abordé en introduction de cette thèse, la transition agroécologique renvoie, pour les agriculteurs, à une démarche de développement autonome de leur activité. L'autonomie est un concept, qui vient du grec auto-nomos et signifie « des lois pour soi, à soi ». L'individu autonome serait donc communément celui qui se gouverne par lui-même en se donnant ses propres règles de conduite. Cette définition donne une vision très individualiste de cet état de l'être humain, qui à l'échelle de la société, pourrait faire référence selon un extrême au libéralisme le plus poussé, ou selon un autre extrême à une organisation autarcique. En réalité si l'on regarde les différents courants philosophiques et scientifiques qui ont construit et mobilisé ce concept d'autonomie, c'est une notion plus complexe. En biologie, et plus particulièrement dans les sciences des systèmes cognitifs, l'autonomie est un des concepts clés de la pensée de Francisco J. Varela (Duquaire, 2003; Varela, 1978). Il propose de définir le principe d'autonomie des systèmes cognitifs humains par le concept d'autopoièse, à savoir la capacité d'un système à se développer lui-même, en permanence et en interaction avec son environnement, ainsi que de maintenir sa structure malgré le changement de ses composants. Selon lui cette capacité est liée à l'enaction propre à l'être humain, qui fait référence à notre capacité à mobiliser notre expérience au moyen d'une réflexion non théorique mais incarnée. Il apporte ainsi une vision du développement de l'individu qui ne serait ni objectivable, ni totalement subjective, sinon inscrite dans l'expérience personnelle et dans la quête du « soi » (sef-regulation et self-law) (Varela, 1978). Cette vision de l'auto-renouvellement permanent de l'homme en interaction avec son environnement rejoint la vision du pragmatiste Dewey qui voit lui le développement et la prolongation de l'expérience de l'individu, à l'interface entre l'individu et le groupe social au sein duquel il évolue (Galetic, 2009). L'autonomie d'un système serait donc bien liée à sa capacité à s'auto-organiser, mais dans une transaction permanente avec l'environnement qui l'entoure, afin d'y construire sa propre place. Il considère l'expérience comme une co-évolution, une adaptation réciproque entre l'organisme et son

environnement. En replaçant les agriculteurs dans un rôle de pilotage des processus de production et d'échanges de connaissances pour la transformation de leurs propres systèmes et en mettant au cœur de ses principes fondateurs leur autonomie et leur souveraineté, les auteurs soutenant une vision forte de l'agroécologie (Gliessman, 2009; Guzmán et al., 2013; Stassart et al., 2012) m'ont donc amenée à positionner le problème de l'accompagnement de la transition agroécologique au niveau de ce dialogue à construire entre individu et collectif dans la construction des changements.

Nous venons de le voir, cette vision de l'autonomie recoupe l'approche de la construction de l'expérience des individus développée par les pragmatistes et notamment par John Dewey via la notion d'enquête (Dewey, 1938). Il me paraît donc prometteur de revisiter l'accompagnement de la transition agroécologique au niveau local en mobilisant le concept de l'enquête. En effet, la réussite de celle-ci relèverait d'une capacité à articuler et faire dialoguer les transformations individuelles des activités avec un débat et une production collective de sens et de cadres pour agir. Cette articulation passe par des transactions entre individus et collectifs. Les processus de transaction sont les processus par lesquels les individus sont contraints d'adapter leurs actions aux évolutions de leur environnement, et réciproquement par lesquels ils transforment en retour cet environnement pour poursuivre leur existence (Bidet & Boutet, 2016). Pour les pragmatistes, l'enquête est l'essence même de l'activité humaine (Dewey, 1938). Face à une situation qui lui pose problème et dont l'issue est incertaine, l'individu n'a d'autre choix que d'agir pour reconstruire une nouvelle cohérence de la situation dans laquelle il se trouve. Dewey parle de redonner un caractère déterminé à une situation devenue indéterminée. Le résultat de l'action nécessite un examen réflexif et collectif pour évaluer ses effets à l'aune de l'intérêt collectif. L'individu se reconstruit alors une nouvelle compréhension de la situation dans laquelle il se trouve, afin de poursuivre ses actions (Dewey, 1938; Lorino, 2015). Les pragmatistes s'interrogent donc sur les conditions du dialogue entre individu et collectifs et proposent, au travers de la théorie de l'enquête, une réflexion philosophique sur les conditions de la démocratie au sein d'une société. Dans cette perspective, une société démocratique est une société qui permet à ses membres de participer à la construction d'un cadre commun d'action et de compréhension des situations dans lesquels ils se trouvent, tout en leur donnant les moyens, dans ce cadre, de se construire en tant qu'individu autonome (Zask, 2011, 2016). Cette notion d'enquête pragmatiste relèverait donc d'un processus dialogique double : 1/ le dialogue entre l'individu et le(s) collectif(s) au sein desquels il se construit ; 2/ le dialogue entre expériences individuelles et collectives de nouvelles façons de faire et échange de ces expériences au niveau de la communauté afin de construire et de mettre en débat ce qui fonde le commun (Cormier, 2012; Dewey, 1927; Zask, 2008).

De mon point de vue, adopter une perspective pragmatiste pour aborder l'accompagnement de la transition agroécologique permettrait de gérer deux tensions inhérentes au processus de transition en lui-même: 1/ celle de la nécessaire définition de cadres d'action au niveau local pour construire des innovations et des connaissances actionnables pour agir, alors même que les visions et les acceptations de l'objectif à atteindre avec la transition des systèmes agricoles sont diverses et débattues ; 2/ et celle de l'autonomisation des agriculteurs dans la recherche de leurs propres solutions qu'appelle la transition agroécologique, alors même que les traductions politiques et sociales de l'agroécologie relèvent d'une injonction de changement qui laisse peu de place aux agriculteurs dans la définition de leurs propres projets et aspirations. Cela demande en revanche de revisiter les cadres du conseil pour l'accompagnement des changements des agriculteurs, autant que les activités des animateurs des collectifs d'agriculteurs. En effet, dans cette perspective, le rôle du conseiller n'est pas de prescrire le changement optimal, et celui de l'animateur n'est pas d'aider le groupe à formuler un problème commun à résoudre, ni de faciliter la mise en relation de différents individus pour le résoudre. Les accompagnants doivent plutôt s'interroger sur la place qu'ils donnent au débat entre les individus et à l'explicitation des projets et stratégies individuelles au sein des groupes qu'ils animent. Atteindre un consensus partiel et ponctuel sur les fins et les moyens du changement ne serait alors pas une fin en soi pour un collectif, mais plutôt un moyen pour les individus de développer leurs propres actions et leurs propres expériences dans un cadre qui fait sens pour eux et pour le collectif auquel ils appartiennent, les expériences qu'ils font étant susceptibles de venir réinterroger ce cadre. Leur rôle serait alors principalement de faciliter les transactions entre individus et collectifs.

Proposition méthodologique pour l'activité d'accompagnement dans une perspective de transition agroécologique

Nous venons de le voir, adopter une perspective pragmatiste pour définir la notion d'accompagnement de la transition agroécologique amène à considérer l'activité des accompagnants comme l'animation d'un processus d'enquête dialogique, articulant re-conception individuelles et collectives des activités d'une part et expérimentations individuelles et collectives en situation et réflexivité/capitalisation des expériences réalisées au niveau de la communauté locale d'enquête d'autre part. Dans le cas du projet SALSA, cette articulation s'est cristallisée autour de deux processus à animer conjointement pour accompagner la transition agroécologique : celui de la co-conception des outils et dispositifs pour l'analyse et le suivi des changements dans les fermes au sein d'un dispositif multi-acteurs intégrant agriculteurs et conseillers agricoles, et celui de leur mise en expérimentation chemin-faisant dans des situations réelles d'utilisation dans les fermes.

Accompagner la co-conception des artefacts pour la transition : activité nécessaire mais non suffisante

La nature même des processus de transition vers des activités et des sociétés plus durables, nécessite de pouvoir appréhender et gérer la complexité et l'incommensurabilité des problèmes à résoudre au cours de la transition. Des travaux sur les processus de transition dans d'autres domaines que le domaine agricole mettent en avant l'intérêt des démarches de co-conception locales, avec les communautés concernées par les changements, des solutions aux problèmes qu'ils rencontrent (Gaziulusoy & Ryan, 2017; Gugerell & Zuidema, 2017). Co-concevoir des solutions à l'échelle d'une communauté locale revient en effet à échanger ses expériences et ses besoins pour construire ensemble un futur souhaité à partir duquel des prototypes de solutions peuvent être proposés (Sanders et al., 2018). Ainsi le processus délibératif ne conduit pas uniquement à la production d'une représentation partagée du problème, mais également à la conceptualisation d'une façon de le résoudre via la mobilisation future de ressources que l'on a contribué à produire (Elzen & Bos, 2015). Une approche de l'accompagnement de la transition agroécologique via l'animation d'un processus de conception collectif et local d'artefacts destinés à outiller les agriculteurs dans la transformation de leur système semble donc prometteuse pour appréhender et gérer la complexité du processus de transition, grâce à la mise en place d'un processus délibératif autour des problèmes rencontrés par les agriculteurs, la construction pas à pas d'une vision commune de ce qui est acceptable en termes de fin et de moyens pour résoudre ces problèmes, et la conception de prototypes de solutions ou d'artefacts à mobiliser dans cette perspectives pour mettre en œuvre la transition dans les fermes. Par artefact, nous entendons toute conception humaine (outil, norme, concept, règle, objet…) construite dans les situations de travail des individus (Barcellini et al., 2013). Le projet SALSA, au sein duquel était insérée ma thèse, a bien été conçu dans cette optique-là. Et c'est aujourd'hui le cas de nombreux projets de co-conception rassemblant chercheurs et agriculteurs dans le but d'outiller la transition agroécologique (Chapitre 1).

Aborder l'activité d'accompagnement local des changements en agriculture comme une activité d'animation d'un processus de conception collective d'éléments de cadrage (dont les artefacts) à mobiliser dans la transition va déjà plus loin que la proposition faite par les chercheurs du Gerdal dans les années 80. En effet, reconnaissant la capacité des agriculteurs à innover par eux-mêmes dans leurs situations, ils positionnaient essentiellement l'activité d'accompagnement des changements des agriculteurs au niveau d'une pratique d'aide à la formulation d'un problème collectif. Mettant l'accent sur l'importance des dynamiques locales de développement et sur les échanges entre pairs, Jean-Pierre Darré avait en effet bâti sa théorie autour du concept de « Groupe

Professionnel local » (Darré et al., 1989; Ruault, 2006). Cette pratique d'écoute et d'aide à la formulation des problèmes reste aujourd'hui encore une compétence plébiscitée par les animateurs de collectifs d'agriculteurs eux-mêmes (Leschiutta, 2018). En revanche, cette proposition ne semble pas complètement adaptée à l'accompagnement de la transition agroécologique, qui appelle à la prise en compte d'enjeux et à la construction des problèmes à une échelle qui dépasse le simple groupe de pairs (groupes multi-acteurs), et invite à l'implication des agriculteurs dans la totalité des chaînes d'innovation et de production de connaissances. De plus, cela nécessite à mon sens de développer de nouvelles compétences pour les animateurs. Des travaux récents sur le renouvellement des collectifs de pairs en agriculture montrent d'ailleurs la complexité des réseaux et des imbrications au sein desquels les agriculteurs construisent leurs propres projets de changement vers l'agroécologie (Thomas et al., 2015). Dans cette perspective, développer les compétences d'animation de processus de co-conception d'artefacts pour outiller la transition, au sein de collectifs multi-acteurs, me paraît nécessaire.

Cependant, l'expérience que j'ai conduite au sein du projet SALSA m'amène à considérer que l'animation d'un processus de co-conception au niveau local n'est pas suffisante pour outiller localement une transition agroécologique. Adopter une approche pragmatiste pour animer ce processus de co-conception, en se basant sur le modèle de l'enquête dialogique permettrait en effet d'aller plus loin que cette première proposition (Chapitre 2). Cela doit en effet conduire l'(es)animateur(s) à considérer que le processus de co-conception n'est pas une fin en soi, mais plutôt un moyen pour les individus qui y prennent part de se positionner au sein d'un débat qu'ils contribuent à façonner, afin de construire le sens de leurs propres actions, dans le cadre légitime pour la communauté locale à laquelle ils participent. Cela doit également les conduire à considérer la conception comme un processus dialogique entre co-conception et usage, qui permet de développer conjointement l'activité des individus et les artefacts utiles à leur propre transformation.

Considérer la co-conception comme un processus de production de sens pour l'action

La première idée que je souhaite développer est celle que la co-conception locale des outils d'analyse et d'évaluation des fermes participe de la mise en débat et de la construction de sens pour le collectif de travail mais aussi pour les individus, leur permettant d'agir dans leurs situations respectives. En effet, ce type d'outil renferme un modèle évaluatif des fermes et une direction pour leur évolution via la transition qui sont alors mis en débat au sein du groupe de conception.

Dans le cas du projet SALSA, l'outil de diagnostic agroécologique des fermes est petit à petit devenu l'instrument d'un débat et de la construction d'un récit commun autour duquel construire les transformations individuelles dans les fermes (Chapitre 3). L'outil de diagnostic agroécologique des fermes co-conçu dans le projet évalue différentes dimensions de l'activité agricole, au regard de critères définis comme pertinents par ses concepteurs du point de vue des problématiques locales sur les élevages (évaluation de l'autonomie alimentaires et de l'efficacité énergétique des fermes ovin-lait, évaluation de l'impact des pratiques sur l'environnement local…). De plus, il cristallise une représentation, une forme de modèle idéal des fermes ovin-lait, que la transition agroécologique viserait à atteindre – des fermes efficaces et le plus autonomes possibles dans l'utilisation des intrants alimentaires et chimiques, se rapprochant le plus possible des conditions de production en agriculture biologique. Au cours du projet, les indicateurs de performances agroécologiques ayant de la valeur pour les participants au projet, et le modèle d'agriculture sous-jacent à l'outil ont été mis en débat à de nombreuses reprises. De mon point de vue, un tournant s'est opéré quant à ces débats lors des ateliers en petites régions, tant par le choix de présentation des résultats qui a été fait, que par la manière dont l'outil a été mobilisé par les éleveurs du groupe de concepteurs pour présenter leurs résultats aux autres (Chapitre 4). En effet, si le choix de la représentation des résultats de l'outil qui a été choisi a stabilisé assez clairement une représentation de l'objectif à atteindre avec la transition pour les participants au projet (le carré en haut à gauche du graphique, Figure n° 3), il a aussi permis de comparer globalement les situations et stratégies individuelles entre elles, et de suivre les trajectoires de changement dans le temps. Les éleveurs du comité technique ayant ensuite présenté leurs résultats aux autres via la présentation de leurs choix et de leurs stratégies vis-à-vis de l'agroécologie, cela a donné une place et une légitimité aux situations individuelles et aux différentes sensibilités dans la manière de mobiliser les différentes dimensions plébiscitées par l'outil, tout en mettant les conseillers en posture d'animation de ces débats (com. IFSA, Annexe 4).

Les outils de gestion, au sens défini par Moisdon (1997) – des outils pour « prévoir, décider, contrôler » l'activité - sont par nature symboliques. C'est-à-dire qu'ils renferment une lecture « économique » des activités qu'ils visent à améliorer pour ses concepteurs et ses utilisateurs. Le terme « économique » fait ici référence à l'idée d'un langage de l'évaluation de l'activité, porteur d'un jugement de valeur, nécessairement un jugement social, sur celle-ci (Lorino, 2002). Barcellini et al. (2015b) ont montré que lors de la co-conception d'un outil de diagnostic de la durabilité des fermes, c'est une vision partagée du concept de durabilité lui-même qui se construit petit à petit entre les participants. L'outil de diagnostic SALSA est dans notre cas devenu un instrument de pilotage de la mutation, au sens d'un support pour la construction progressive d'une représentation des changements à construire, à partir de laquelle se sont structurés des négociations et des débats

contradictoires, qui permettent in-fine ce changement (Moisdon, 1997). Le débat et le dialogue permis par l'outil, puis inclus dans la manière même de le mobiliser avec les éleveurs ont contribué à construire une forme de récit commun (Bosma et al., 2016; Lorino, 2015), faisant sens pour les éleveurs participants dans la construction de leurs propres trajectoires de changement (Chapitre 2).

En revanche, il convient de s'interroger sur la capacité de l'outil à réellement participer de la construction d'un cadre de compréhension et de représentation commun de l'agroécologie au-delà des participants au projet, et donc de ceux qui ont fait la démarche de venir participer. Un des objectifs du projet pour l'AVEM était d'engager ses adhérents dans une transition agroécologique. Il est vrai qu'en début du projet, seul un petit groupe d'adhérents (5-6 éleveurs du CA) était impliqué et participait au projet. Ce nombre était passé à une trentaine en fin de projet. Cette trentaine d'éleveurs participants n'étaient pas figés et certains éleveurs qui se sont appuyés sur le projet pour construire des changements chez eux n'ont participé qu'à très peu de rencontres organisées dans le cadre de SALSA et ne sont pas des éleveurs moteurs de l'association. Pour autant, force est de constater que le projet n'a pas mobilisé l'ensemble des éleveurs et ceux qu'il a mobilisés sont majoritairement des éleveurs en demande d'accompagnement ou intéressés par la mise en place des pratiques agroécologiques. Il est difficile de savoir si une extension du projet et de sa dynamique dans le temps aurait permis de toucher plus d'éleveurs. La question reste donc ouverte de la façon de toucher, d'intéresser et donner l'opportunité à une majorité des éleveurs de prendre part aux débats et aux animations, afin d'y contribuer, voire d'en tirer à leur tour un bénéfice.

Dans son essai sur les formes démocratiques de la participation, Joëlle Zask (2011) soutient la thèse selon laquelle une participation démocratique à toute entreprise collective dans une perspective pragmatiste correspond pour chaque individu à la possibilité d'y prendre part (c'est-à-dire de pouvoir y prendre la parole), d'y contribuer (c'est-à-dire de le modeler par ses apports) et d'en bénéficier (c'est-à-dire d'en tirer des opportunités d'individuation et de développement de ses activités), de manière équilibrée et réciproque. On peut alors s'interroger sur la façon de s'y prendre pour animer un processus de co-conception qui favorise cet équilibre dans un contexte de crise de la participation dans nos sociétés et de la diversité des acceptions individuelles de la notion de transition agroécologique. A l'AVEM, le problème de la participation à la vie et aux événements collectifs des adhérents est un problème récurrent, comme dans beaucoup d'organisations collectives aujourd'hui. Cependant, une analyse des motivations des éleveurs à adhérer à l'AVEM au début de ma thèse m'avait permis de me rendre compte d'une diversité de raisons personnelles, tout autant que de visions des métiers d'agriculteur et de conseiller agricole au sein de l'association, qu'il aurait été difficile d'embarquer dès le départ dans le projet SALSA. L'aller-retour entre

conception et usage de l'outil, l'ouverture en cours de projet à l'ensemble des éleveurs de l'association pour qu'ils puissent à la fois en prendre connaissance, donner leur avis sur l'outil et son utilisation et éventuellement s'en saisir pour instruire leurs propres questions lors des animations collectives proposées dans la deuxième partie du projet sont des éléments qui visaient à une plus grande participation démocratique des éleveurs. Pour autant les conditions d'équilibre entre les différents éléments de la participation proposée par Zask (2011), et leur maintien dans le temps au-delà du projet, restent difficiles à mettre en œuvre, et c'est à mon avis une des limites de l'approche pragmatiste que je propose. En effet, la pensée pragmatiste développe un idéal démocratique qui a les limites de ses propres vertus : il reste un idéal. De mon point de vue, il serait également nécessaire d'appréhender et d'outiller l'accompagnement de la transition agroécologique au niveau local en s'intéressant à la façon dont les jeux de pouvoir entre individus et leur participation au processus de transition façonnent le cheminement collectif. Cela permettrait sans doute de mieux équiper les personnes en position d'accompagnement des collectifs en transition pour gérer ces questions.

Considérer la co-conception comme un processus dialogique entre conception et usage permet le développement conjoint des instruments et des activités

La deuxième idée que je souhaite développer est celle qu'une approche pragmatiste de l'accompagnement de la transition agroécologique nécessite de considérer la co-conception comme un processus dialogique entre co-conception et usage, afin de faciliter le développement conjoint entre l'activité des individus et les instruments utiles à leur propre transformation. En effet, le processus d'enquête collectif tel que défini par les auteurs pragmatistes ne s'arrête pas à la délibération autour du problème, ni à la formulation d'hypothèses d'action pour les résoudre, qu'elles soient cristallisées dans des artefacts, ou simplement dans des énoncés. Le cœur même de l'enquête se situe dans l'expérimentation en situation, par les individus qui composent la communauté d'enquête, de ces hypothèses. C'est dans l'expérimentation que les hypothèses formulées prennent sens et peuvent être évaluées au regard de leurs effets attendus.

Opérationnaliser cette approche pour accompagner la transition agroécologique nécessite donc d'envisager l'animation du processus de co-conception locale comme un dialogue permanent entre conception et usage en situation des artefacts produits pour outiller la transition. En se basant sur une conceptualisation du processus de conception comme un développement conjoint des artefacts et de l'activité de ceux qui en feront usage, Beguin et al. proposent de mettre en œuvre les processus

de conception comme des dialogues permanents entre concepteurs et utilisateurs (Beguin, 2013; Béguin et al., 2012). Nous l'avons dit, tout outil de gestion renferme une représentation de l'activité (Beguin, 2013), et une dimension évaluative de ses performances (P. Lorino, 2002). Il renferme également un schème d'action permettant au sujet de le mettre en œuvre. En ce sens, d'après Lorino (2002), l'outil en tant qu'instrument n'est pas dissociable du sujet qui l'utilise et réciproquement. Hatchuel et Weil (1995) parlent, dans une perspective assez proche, des trois différentes dimensions d'un outil de gestion qui sont progressivement définies au cours de sa conception : son substrat technique, son modèle organisationnel et sa philosophie gestionnaire. *In fine*, c'est bien la confrontation progressive de l'outil à différentes situations d'usage, et sa mobilisation par ses utilisateurs au cours de ces situations au fil de la conception, qui peuvent permettre de faire co-évoluer l'outil et la façon dont ses utilisateurs le mobilisent, tout en le gardant suffisamment ouvert pour que de nouveaux utilisateurs potentiels puissent s'en saisir pour eux-mêmes et pour prendre part au débat collectif.

Dans le cas du projet SALSA, animer un processus de co-conception-expérimentation d'outils d'analyse des fermes a permis de développer conjointement l'outil en tant qu'heuristique pour penser l'action des conseillers et des agriculteurs dans la transition, mais également de faciliter la transformation de la relation entre eux vers une relation accompagnants-accompagnés (Chapitres 2 et 4). Dans le cas du projet SALSA, cela a également permis de construire de nouvelles coordinations entre différents conseillers qui travaillent habituellement séparément et n'interviennent pas ensemble dans les fermes (Chapitre 2). Enfin, pour les différents partenaires du projet, le fait que nous ayons poussé le processus vers une itération entre conception et usage a permis de faire collectivement l'expérience d'une autre manière de conduire un projet de recherche-développement en partant des attentes et des représentations des agriculteurs et en produisant des connaissances et des outils directement mobilisés dans les fermes par les agriculteurs pour la mise en œuvre de leurs propres changements (Chapitre 3). Hatchuel & Moisdon (1993) parlent d'apprentissage organisationnel lorsque le dispositif d'intervention permet de faire se confronter le modèle envisagé pour l'action avec les dispositifs d'action existants.

Cependant, on peut s'interroger sur la pérennité de ces apprentissages au-delà du projet et notamment la capacité qu'auront les partenaires à se ressaisir de cette expérience collective dans leur propre pratique. En effet, quelles capacités ont les organisations locales de conseil elles-mêmes d'organiser des espaces de réflexivité et d'expérimentation engageant conseillers et éleveurs dans le test de nouvelles façons de faire ? Le cas de la transition agroécologique est en effet complexe car il implique une transformation conjointe de l'activité des agriculteurs et des conseillers, dans le cadre

de projets susceptibles d'embarquer une diversité d'acteurs locaux aux attentes et aux activités variées. Cela m'amène en dernier lieu à m'interroger sur le type de dispositif d'accompagnement de ces processus à développer à l'échelle locale. Qui finalement est en mesure d'assurer une fonction d'accompagnement de ces processus ? On touche ici de mon point de vue à une limite de la proposition conceptuelle de dialogue entre conception et usage des outils de gestion dans une perspective pragmatiste pour l'accompagnement de la transition agroécologique. Si ce dialogue doit être permanent pour permettre une adaptation et un apprentissage des concepteurs et des utilisateurs, leur permettant ainsi de gérer la complexité et l'incertitude des situations de transition, quels moyens cognitifs, humains et financiers les organisations de développement ont-elles pour développer ce type de démarches sur le long terme, en plus de leurs activités quotidiennes, alors qu'elles sont elles-mêmes aux prises avec une problématique d'évolution de leurs activités et services ? Il me semble qu'il est nécessaire d'aborder cet accompagnement comme une fonction distribuée entre plusieurs acteurs et de s'interroger sur la gouvernance collective de tels dispositifs. C'est ce que je ferai dans une dernière partie de ma discussion, en revenant sur la démarche mise en place au sein du projet SALSA.

Retour sur la démarche d'accompagnement au sein du projet SALSA

Animer une démarche locale de co-conception-expérimentation

L'animation du projet SALSA en tant que telle et de la démarche de conception en particulier est un sujet qui n'a jamais été abordé frontalement au sein du comité technique. Dans les faits, elle a beaucoup été réduite et contrainte par les termes même de l'appel à projet CASDAR. En effet, la perspective de devoir construire et faire fonctionner un partenariat local, celle d'une obligation de résultats capitalisables au niveau national, et la réalisation des actions prévues dans un temps et avec des ressources limitées ont été des préoccupations permanentes pour l'agronome de l'AVEM, en charge de l'animation du projet. A plusieurs reprises lorsque nous préparions ensemble les journées d'animation pour les petits groupes d'éleveurs volontaires, elle m'a fait part de ses difficultés à gérer de front des objectifs qui lui semblaient complètement contradictoires : celui d'une obligation de résultats et de rendu dans les trois ans du projet, et celui de la construction d'un outil chemin-faisant, dans une logique d'adaptation permanente. *In fine*, il a été acté au sein du comité technique du projet, qu'un élément important de résultat du projet était justement la méthode de conception collective développée, qui leur semblait également plus générique que l'outil et les résultats de diagnostic, étant eux des résultats mobilisés et mobilisables localement, directement avec les éleveurs. L'animation d'une démarche de conception-expérimentation telle qu'elle s'est

mise en place au fil du projet SALSA n'en reste pas moins contradictoire avec les financements du développement agricole actuel, qui ont tendance à financer des actions concrètes et prévues, mais ne financent pas tout le travail d'animation permettant d'organiser le dialogue entre les différentes actions dans une perspective d'apprentissage et de réflexion sur le temps long des actions conduites. Elle demande en tout cas pour les animateurs de développer des compétences de gestion de projet « chemin faisant » (Avenier, 1997), afin d'être en capacité d'adapter les projets aux surprises et expériences en cours de route.

Un deuxième point qu'il me semble important d'aborder concernant l'animation du processus de conception-expérimentation est celui de la question importante de l'articulation et du dialogue entre différents espaces-temps et différents types de personnes : un dialogue et une articulation entre un espace-temps de la conception et celui de l'usage ; un dialogue et une articulation entre les personnes pertinentes pour la conception, qui ne seront pas toutes directement concernées par l'implémentation des outils et connaissances produites, et les personnes directement concernées par l'implémentation en elle-même et dont la transformation des pratiques est visée. Alors que l'animatrice agronome et moi-même avancions dans l'animation des journées à destination des éleveurs, et que les usages de l'outil de diagnostic se développaient, une difficulté nous est apparue : celle de rendre compte au comité technique de ce qui se passait au cours de ces journées d'animation afin de leur donner à voir la façon dont l'outil continuait d'évoluer, et de discuter avec eux des suites à donner sur le plan de sa conception. Malheureusement, il n'a pas été possible pour moi de me ressaisir entièrement de ce questionnement pour en faire quelque chose dans le temps du projet, car il s'est terminé rapidement après cela. Cependant, cette question me paraît importante pour gérer les allers-retours entre des espaces qui peuvent rassembler des personnes aux activités très différentes les uns des autres. Cette question a déjà été en partie conceptualisée sur le plan théorique par Falzon et Darses (1996), mais il me semble que sa traduction concrète dans la pratique de l'animateur d'un processus de conception-expérimentation reste à explorer. La mobilisation d'outils utilisés en ergonomie telle que l'auto-confrontation ou l'instruction au sosie pourrait de mon point de vue être des outils intéressants pour organiser le dialogue entre les espaces, mais leur manipulation demande des compétences en ergonomie dont sont rarement pourvus les animateurs des collectifs susceptibles de porter ce type de projet. Une autre façon de faire serait de construire des binômes d'animation constitués d'ergonomes et d'animateurs « terrain », pour partager les responsabilités et les compétences d'animation sur ce type de dispositif.

Le portage du projet par des éleveurs et conseillers pour eux-mêmes

Le fait que le projet soit porté par une association de conseillers et d'éleveurs, avec l'implication forte d'éleveurs de l'association tout au long du projet, pour eux-mêmes et au nom de leurs collègues a permis de rendre l'outil opérationnel pour eux et leurs conseillers en premier lieu. Les éleveurs impliqués dans le comité technique ont été des moteurs et des ambassadeurs du projet au sein de l'association. Ils ont à la fois contribué à faire exister et vivre le projet au sein de l'association, mais ils l'ont également fortement orienté selon leurs propres représentations du problème. Paradoxalement, cette présence forte a permis de faire avancer le projet, autant qu'elle l'a contraint (Chapitre 4).

Avec du recul, il me semble que ce portage par les éleveurs et leurs conseillers eux-mêmes a été un atout pour construire un outil appropriable et approprié par ses utilisateurs. D'une part, cela a conduit à embarquer dans l'outil des représentations de l'activité agricole opérantes pour les éleveurs. D'autre part, cela a permis aux conseillers d'endosser un rôle de concepteurs-utilisateurs, qui leur a permis d'apprendre à utiliser l'outil ensemble et de faire évoluer leurs pratiques par eux-mêmes. Dans son travail de thèse en modélisation participative, Lucie Gouttenoire a mis en avant l'intérêt de partir des représentations et des questionnements des éleveurs eux-mêmes pour modéliser l'activité agricole, l'activité de modélisation et les modèles co-conçus devenant alors opérants pour eux dans la re-conception de leurs propres activités (Gouttenoire et al., 2011; Gouttenoire et al., 2013). De plus, le fait de partir d'outils existants et déjà opérants du point de vue des conseillers du groupe de concepteurs a permis de mon point de vue de faciliter l'apprentissage pour ceux-ci d'autres modes d'utilisation de l'outil. En effet, le processus d'appropriation d'un artefact relève selon Beguin (2005) d'un processus de genèse instrumental au cours duquel l'individu instrumente son action via sa mobilisation. Pour que ces genèses instrumentales puissent avoir lieu, il est nécessaire que l'outil proposé soit suffisamment proche de l'utilisateur et de ses représentations pour qu'il puisse s'en saisir pour développer son action (Prost, 2008). Engeström, reprenant Vytgoski, parle de zone proximale de développement pour parler de la zone au sein de laquelle il est possible de faire évoluer un outil, tout en restant suffisamment proche de son utilisateur pour que celui-ci puisse se saisir de cette évolution (Engestrom, 2000; Engeström & Sannino, 2010). Il est probable que si les éleveurs et les conseillers n'avaient pas été moteurs dans la conception et l'expérimentation de l'outil, et que si nous n'étions pas partis de leurs habitudes et de leurs représentations pour le construire, il aurait été beaucoup plus difficile pour eux de se saisir de la proposition d'utilisation différente que je leur ai faite dans la deuxième partie du projet, qui

s'inscrivait dans une logique différente de la leur. Leur place dans le dispositif déployé au sein du projet SALSA a donc de mon point de vue été centrale.

Cependant, il convient de s'interroger sur le risque d'appropriation par quelques-uns de ce type de projet. Dans le cas le moins problématique, cela peut conduire à l'échec du projet qui reste le projet de quelques-uns, voire n'aboutit pas faute d'élargissement et de participation d'autres individus concernés. Dans le pire scénario, le projet peut devenir un instrument de la prise de pouvoir par quelques-uns au sein du groupe de travail et laisser de côté ceux dont les idées et les pratiques ne rentrent pas dans le « moule » du projet. Le maintien d'une démocratie interne au sein des organisations de conseil et de développement local doit permettre d'éviter ce genre d'écueil. Mais cela pose des questions de taille critique de ces organisations au niveau local, de la façon dont elles s'engagent dans le portage de tel dispositifs et de la formation des conseillers à la pratique d'animation des débats contradictoires et des échanges au sein des groupes locaux d'agriculteurs et avec d'autres acteurs, afin de donner la parole aux différentes sensibilités existantes dans et en dehors de leurs organisations. Si certaines organisations telles que les CIVAM revendiquent de telles pratiques depuis leur création, ce n'est pas forcément le cas de toutes les organisations de conseil et développement local. Une chose est cependant certaine, la déclinaison politique de l'agroécologie en France développé en 2012 par le Ministre Stéphane Le Foll, qui s'est traduite par le financement de projets portés par des groupes d'agriculteurs, dont le projet SALSA, a engagé une dynamique de reconfiguration de l'accompagnement du changement des systèmes agricoles, et de la place des agriculteurs dans sa construction. Ce constat est d'ailleurs l'une des conclusions du projet d'Observatoire des mobilisations collectives pour l'agroécologie mis en œuvre par des chercheurs en sciences sociales du département SAD, et auquel j'ai pris part (https://colloque.inra.fr/mcae-obs/). La question de la façon dont les organisations de conseil et de développement local vont se re-saisir de ce problème reste cependant incertain, et il paraît important de le suivre, voire de l'accompagner.

Le rôle des chercheurs au sein du projet

Un dernier point que je souhaiterais développer est celui du rôle des chercheurs dans de tels dispositifs. En effet, nous avons été, de fait, plutôt dans une position d'accompagnement du processus collectif de conception et d'expérimentation collective, en étant notamment force de proposition, que dans un rôle d'animation, de gestion et de portage de ce processus nous-mêmes.

Pour des chercheurs revendiquant de développer des recherche-action ou des recherche-intervention, cette position peut être assez inconfortable et frustrante. N'étant pas aux manettes du projet, nous n'étions pas en position de conduire et d'animer le processus de travail collectif comme

nous l'aurions entendu. Notre rôle a plutôt été d'accompagner l'enquête collective, en favorisant la prise de recul et la réflexivité chemin-faisant du groupe, et en étant force de proposition quant au processus de conception-expérimentation. A plusieurs reprises, nous avons proposé aux partenaires une lecture de notre compréhension de la situation de travail collective dans laquelle nous étions embarqués, essayant de favoriser la prise de recul sur cette situation (cf. deux exemples de mes présentations faites au sein du comité technique du projet SALSA en Annexes 3 et 5). Par la suite, alors que la première utilisation prévue de l'outil pour faire ressortir des leviers d'action activables dans les fermes ne semblait pas produire les effets attendus, j'ai proposé une autre façon de mobiliser l'outil et les résultats des diagnostics au sein d'un dispositif continu d'animation en petits groupes pour les éleveurs volontaires. Cette expérimentation conduite en collaboration directe avec les conseillers de l'AVEM a permis de développer une nouvelle activité d'animation et de coordination entre les conseillers au sein de l'association pour accompagner les éleveurs dans la transition.

Ce rôle d'accompagnant du processus de conception a été mis en avant comme un rôle à développer et à valoriser pour les agronomes dans leurs activités, afin de favoriser notamment le dialogue entre les objectifs de la conception et leurs ajustements en réponse à la mise en situation (Prost et al., 2018). Il favoriserait le développement du processus de conception au-delà de l'invention. Il implique donc que le chercheur se positionne dans un rôle de médiateur, plutôt que d'expert (Steyaert et al., 2016). En revanche, il n'est pas forcément simple à tenir, car c'est un rôle rarement attendu par beaucoup de partenaires de terrain avec lesquels nous travaillons, qui demande, de plus, une forte implication sur le terrain et une certaine capacité de remise en cause de ses propres questionnements et façons de faire, en fonction des orientations prises par le groupe de travail.

Construire ce type de posture en tant que chercheur m'a conduit à m'interroger sur l'éthique du chercheur-accompagnant (Beauvais & Haudiquet, 2012). Notamment, je me suis beaucoup questionnée sur la façon de ne pas outrepasser mon rôle de chercheur lors de mon intervention, dans un souci de ne manipuler personne, et de ne pas imposer quoi que ce soit aux gens avec lesquels j'ai travaillé. Ce souci s'est doublé d'une préoccupation sur le devenir de mes propositions une fois le projet terminé. Une façon de gérer ce double questionnement pour moi a été de discuter et faire valider mes propositions d'animation dès le départ par les éleveurs de l'AVEM et les membres du projet SALSA, et de proposer à l'animatrice du projet un binôme d'animation des journées à destination des éleveurs. Il est évident qu'une fois cette proposition faite et après de longs échanges pour s'accorder sur nos rôles et postures en tant qu'animatrices, il n'était pas

question de verrouiller le dispositif que j'avais proposé, mais plutôt de l'adapter au fil des journées en fonction des opportunités et des demandes des éleveurs et conseillers. C'est cette co-animation qui a, de mon point de vue, été la source des développements les plus importants de l'outil en tant qu'instrument finalisé dans une pratique d'animation à l'AVEM. Elle m'a personnellement permise de rester en accord avec la posture de recherche-intervention qui était la mienne pendant cette thèse, en restant dans une logique de recherche-accompagnement (Beauvais & Haudiquet, 2012) qui faisait sens pour moi. Développer des binômes d'animation entre chercheurs et animateur « terrain » me paraît être une piste intéressante pour la conduite de dispositifs locaux d'accompagnement de la transition agroécologique.

Enfin, un dernier rôle du chercheur sur lequel je souhaite revenir est celui de la production de connaissances scientifiques et pratiques au sein de ce type de dispositif. En effet, cette question ne me paraît pas triviale. A moins d'instrumenter complètement le dispositif au service de sa propre question de recherche, ou que la question de recherche à traiter corresponde parfaitement avec la préoccupation du groupe à un moment donné, il me semble difficile de coupler complètement la participation à ce type de dispositif et la production de connaissances scientifiques directement issues de ces dispositifs. Hors si les deux premières situations sont en partie envisageables dans le cas des sciences biotechniques, ou de certaines sciences sociales mobilisant uniquement des méthodologies d'observation ou d'analyse de données, elles me semblent plus compliqués à mettre en place dans le cadre d'une recherche-action (Lewin, 1946), et a fortiori des recherche-intervention en sciences de gestion (David, 2000). Pourtant l'implication des chercheurs en sciences de gestion dans ce type de dispositif, notamment pour en faciliter la gestion et l'avancement, est largement plébiscitée (M. Duru, 2013). Le problème tient au fait que le mode de production de connaissances passe par un processus d'analyse et d'interprétation des situations observées et vécues au regard des théories existantes. Ce processus me semble difficilement compatible avec une implication forte et répétée sur le terrain dans des postures « actives ». La production des connaissances scientifiques nécessite en effet une « désadhérence » des situations réelles (Schwartz, 2009), qu'il a été difficile de mettre en œuvre pour moi, tant que mon implication sur le terrain était forte. De plus, cette production de connaissances peut apparaître en décalage aux personnes du terrain, qui ne sont pas toujours prêtes à questionner leurs façons de faire, leurs modes d'interaction et d'organisation. En revanche, les dispositifs de recherche-intervention permettent de produire des connaissances directement mobilisées par les participants au processus dans leurs propres questionnements et pratiques, même si l'observation des transformations que cela engendre ne peut réellement s'observer qu'après plusieurs années. Il me paraît donc important de valoriser plus ce type de

posture de recherche permettant de produire des connaissances à la fois théoriques et pratiques sur et pour les dispositifs locaux d'accompagnement de la transition agroécologique.

Propos conclusifs

Photo 7: Etonnement. Brebis causse surprise à l'auge. Eté 2016. Source Camille Lacombe

A l'issue de cette thèse, je propose développer une approche pragmatiste pour accompagner la transition agroécologique au sein de dispositifs locaux et multi-acteurs. La stratégie que j'ai développée m'a amenée à la fois à construire une réflexion théorique sur la nature de l'accompagnement de la transition agroécologique, et à tester des propositions méthodologiques et pratiques pour sa mise en œuvre. Ainsi, je propose de voir l'accompagnement de la transition agroécologique comme un processus articulant re-conception de l'activité individuelle des conseillers et agriculteurs et co-conception d'un projet de transition agroécologique débattu au niveau local et dans le cadre duquel développer des artefacts pour outiller le changement.

En termes de perspectives pour de futures recherches, je mettrais en avant trois pistes principales. Tout d'abord, il me semble important de développer et d'éprouver la proposition théorique et pratique issue de ce travail sur d'autres terrains, au sein d'autres dispositifs locaux d'accompagnement de la transition agroécologique. Cela permettrait en effet d'en tester sa pertinence dans d'autres situations. Ensuite, une des limites de mon travail tient dans le fait qu'il n'a été réalisé que sur un seul terrain. Cela ne m'a pas permis d'analyser la manière dont le type d'artefact co-conçu influence le processus d'enquête collective et la participation des agriculteurs et des autres acteurs au sein du dispositif. Dans notre cas, le fait de le travailler autour d'un outil de diagnostic et d'analyse de fermes a beaucoup orienté les choses et a pu en partie décourager certains éleveurs de participer, car ils ne se sentaient pas concernés par le travail de conception ou n'étaient pas d'accord avec le modèle porté par l'outil. En revanche, le fait de travailler sur ce type d'artefact a permis d'embarquer les questions de la relation éleveurs/conseillers dans les situations de conseil et de la représentation du métier d'éleveur, qui ont été toutes deux questionnées lors de la mise en test de l'outil en situation. On peut donc s'interroger sur la façon dont le type d'artefact co-conçu influence le processus de travail collectif et favorise ou non des transformations de l'activité individuelle des différents participants. Enfin, il me paraît important de pousser plus loin l'analyse et la réflexion sur la gouvernance et l'organisation des dispositifs d'accompagnement locaux de la transition agroécologique, en confrontant les résultats de ce travail à d'autres cas, sur d'autres territoires.

En tant que doctorante, ingénieure agronome, cette expérience de thèse a été riche d'apprentissages et de questionnements sur ma propre formation. En effet, rarement je n'avais eu auparavant l'opportunité de pousser si loin des réflexions théoriques sur une question, tout en aillant dans le même temps la possibilité de l'outiller pour la mettre en test dans le « vrai monde ». Cette position a parfois été source d'inconfort et de fortes incertitudes sur ma capacité à construire des hypothèses suffisamment robustes pour qu'elles produisent les effets attendus, que j'espérais utiles

pour mes partenaires de travail sur le terrain. Elle m'a surtout permis de développer un fort esprit critique sur mes propres pratiques, tant dans mon activité de « chercheur impliqué » que dans mon activité ponctuelle d'animatrice sur le terrain. A l'issue de ce cheminement, il me semble que si ma formation d'ingénieur m'avait permis de prendre conscience de la complexité et de la diversité des enjeux des processus de transition agroécologique, elle ne m'a pas complètement donné les moyens, ni la hauteur critique suffisante pour y prendre part en tant que praticien réflexif, à l'interface entre sciences et action. Je ne me risquerais pas ici à faire des recommandations pour la formation des étudiants ingénieurs. Cependant, ma propre expérience me laisse à penser qu'il est utile de développer ses capacités d'enquête critiques et d'action dans le cadre de situations collectives de transition réelles, où les cartes du jeu et la répartition des joueurs ne sont pas définis à l'avance, et où la complexité de la situation n'est pas réduite dès le départ. Me trouver en situation de participer à une enquête collective réelle dans le cadre de ma formation doctorale a été une source de développement personnel et professionnel important, et m'a permis d'outiller mon action, tant sur le plan théorique que pratique.

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Photo 8: Eparpillement. Brebis à la pâture sur les hauteurs de Millau. Eté 2016. Source Camille Lacombe

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A pragmatist approach to support agroecological transition: action research with a farmers and advisers association in the Roquefort area

We explore in this research the organizational dimensions of agroecological transition and the ways to support it locally. The support of agroecological transition requires connecting different processes of individual and collective transformations of agricultural development and production activities. We design a device for action reseach within an agroecological transition project, carried by a farmers and advisers association in the Roquefort area. We implement with them a social experiment to explore this problem both from theoretical and practical point of view. In our case the connection between individual and collective transformation of participant activities required farmers and advisers to design together tools to accompany the agroecological transition on farms. This process allowed the debate about the diversity of agricultural models and representations that actors have regarding agroecological transition. It as well allows engaging advisers and farmers jointly in the agroecological transition. These transformations have been enhanced by the fact that the co-design process was organized as a dialogical process between design and experimentation of the tools in diverse real situations of use on farms. At the end of this journey, we propose to develop a pragmatist approach to accompany locally the agroecological transition.

KEYWORDS :

Co-design, Management tools, Dialogical inquiry, Agroecology, Dairy-sheep farming systems, Social experiment

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TITRE : Approche pragmatiste de l'accompagnement d'une transition agroécologique : une recherche action avec une association éleveurs et conseillers dans le rayon de Roquefort

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Ce travail de thèse explore les aspects organisationnels de l'accompagnement local de la transition agroécologique. Cet accompagnement nécessite d'articuler différents processus individuels et collectifs de transformation des activités de la production et du développement agricole. En construisant un dispositif de recherche-action au sein d'un projet de transition agroécologique porté par une association d'éleveurs et conseillers dans le rayon de Roquefort, nous mettons en œuvre avec eux une forme d'expérimentation sociale qui nous permet de comprendre le problème de l'accompagnement de la transition à la fois sur le plan théorique et pratique. Dans notre cas, l'articulation des transformations individuelles et collectives a été permise par un travail de co-conception entre éleveurs et conseillers des outils de l'accompagnement des changements dans les fermes. Ce processus a permis de débattre de la diversité des modèles agricoles et des représentations des acteurs de la transition agroécologique au sein du groupe, ainsi que d'engager conjointement éleveurs et conseillers dans la transformation de leurs pratiques. Ces transformations ont été d'autant plus facilitées que la co-conception a été envisagée comme un processus dialogique entre conception et expérimentation dans différentes situations réelles d'usage dans les fermes. A l'issue de ce travail, nous proposons une approche pragmatiste pour accompagner localement la transition agroécologique.

MOTS-CLES : Co-conception, Outils de gestion, Enquête dialogique, Agroécologie, Systèmes d'élevage ovin-lait, Expérimentation sociale

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